ELECTRICAL WORLD

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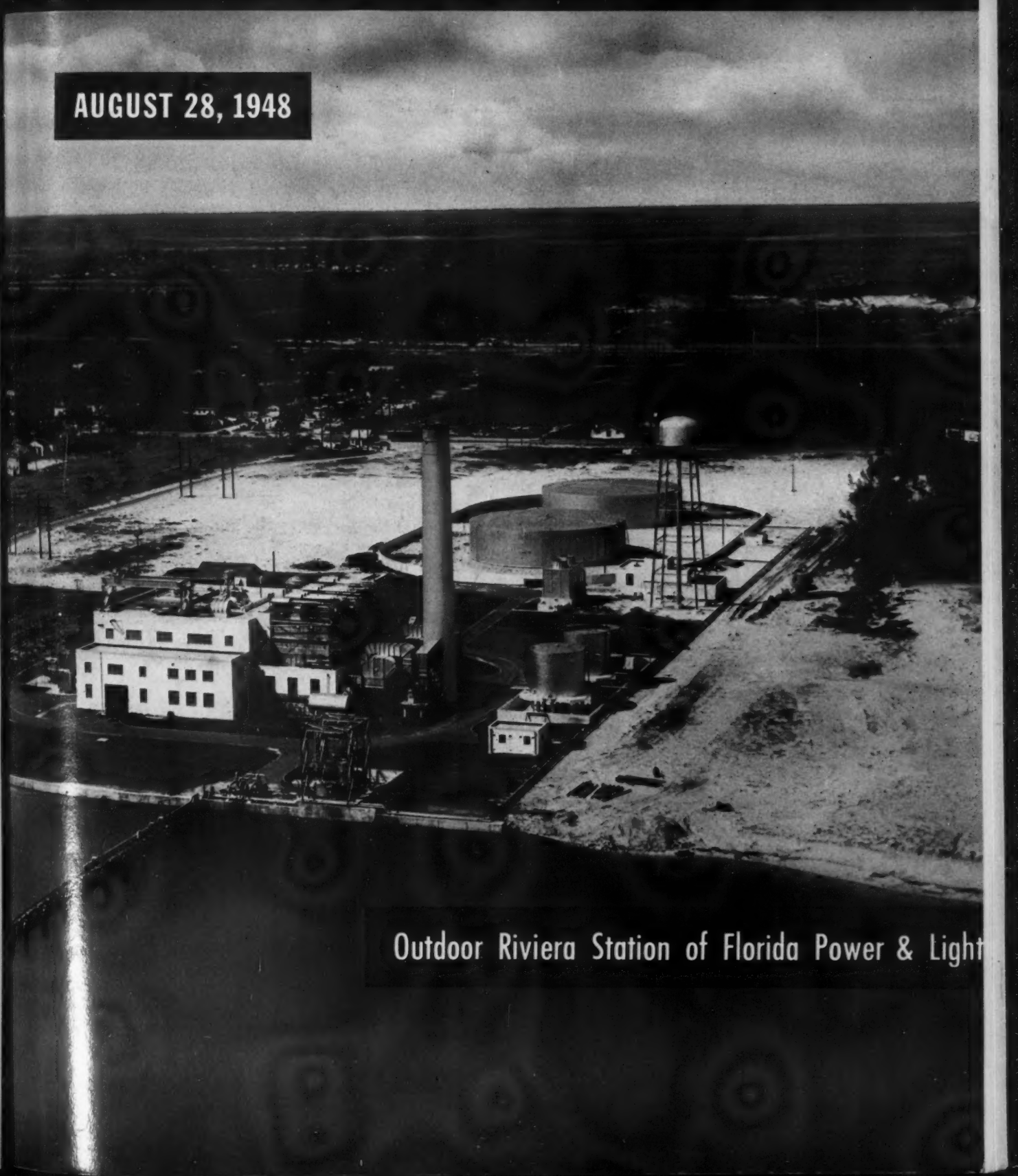
AUGUST 28, 1948



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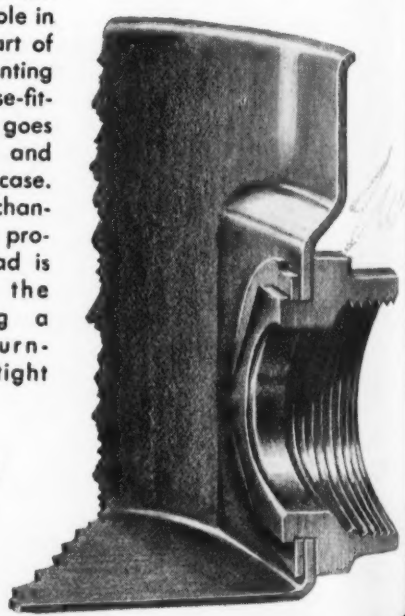

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ELECTRICAL WORLD

Published for 74 years for those engaged in the business of generating, transmitting, distributing or applying electric power

August 28, 1948 **CONTENTS** Vol. 130 No. 9

This Week's Cover Picture

Riviera Station of Florida Power & Light is an outstanding example of outdoor construction. The boiler is outdoors and the turbine is accessible to a gantry on the roof after removal of a ceiling section.

Editorials 59
News of the Electrical World 61
Washington Comment 70
Technical Trends 70

Turbine Manufacturing Capacity Adequate for 7 Years 71
Joseph Pope, Stone & Webster Engineering Corp

Outgrown Distribution System Replaced 74
Victor L. Drummond, Chevrolet-Detroit-Forge Division of General Motors Corp

New Trailer, Tension Indicator, Speed Western Cable Job 77
F. B. Schullerts, Pacific Gas & Electric Co

Determining Least Cost by Kelvin's Law 79
W. R. Bullard and Chase Hutchinson, Ebasco Services, Inc

What of the Industrial Load? 82
H. J. Flagg, Board of Public Utility Commissioners of the State of New Jersey

Increased Facilities Geared to Analysis of Load Trend 84
Margaret R. Hansen, Public Service Electric & Gas Co

HOW TO 87
Engineering Reference Sheet 96
New Equipment 110
Load Building 106
News About People 119
Manufacturers and Markets 122
New Electrical Construction 124
Recent Rate Changes 125
Technical Literature 126
Letters 129
Index of Advertisers 134

COMING IN THE SEPTEMBER 11 ISSUE
The First of Three Articles on
Economics of Subtransmission

FACTS POINT TO

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FOR GENERATOR LEADS

THIS IS A SEGMENTAL CONDUCTOR. A 1,750,000 CM segmental conductor carries the same load as a 2,000,000 CM concentric conductor, costs less in all but short lengths, and is equally flexible, its improved design utilizing segment interstice fillers and additional tapes. Conductor: Okoloy-coated to prevent corrosion and shielded by Semicon tapes to prevent internal corona cutting on all cables operated at more than 2,000 volts between phases.

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OKONITE insulated wires and cables

THE BEST CABLE IS YOUR BEST POLICY

AUGUST 28, 1948

. . . Let No Man Cast Asunder

THERE'S A "MUST READING" assignment for that section of the electric utility industry's top management which has any concern over industry public relations. It will be found in *Printer's Ink* for August 6, 1948. The piece was authored by John O. Young, a co-founder of Young and Rubicam, and it bears the engaging headline—"Free Enterprise—Talking to Itself."

In brief, Young's story concerns an illfated, early postwar venture by the National Association of Manufacturers. NAM assembled considerable money and a lot of talent to put on a broad advertising campaign. The campaign was to sell free competitive enterprise to the mass of Americans who must grasp its meaning and endorse its principles if they are to continue sharing its benefits.

When the campaign had been started—after monumental travail—Young writes:

". . . . I found that a member, just one of the 20,000 members, had frightened the executive committee into forsaking the entire plan. He had raised such a hullabaloo about the advertising when it appeared in the newspapers of his city, the copy having impinged upon a problem that his company was experiencing, that he, practically single-handed, wrecked the entire NAM advertising program . . .

"Since then, of course, NAM has made other attempts to advertise the free enterprise system . . . but it has seemed to me that NAM is still back in the old rut, talking to itself, making timid copy experiments, neglecting to put a simple, courageous theme persistently in front of the masses."

The reason why Young's piece is "must reading" for top electric utility management today should be obvious. It's that policy decision which will face directors of the Edison Electric Institute at their September meeting—the future of that industry "public information program." The difficulty which has been experienced this summer by those who would promote such a program indicated that the disunity which has plagued the power business so long continues today. Disunity, of course, could wreck any such program as is proposed.

What a pity it would be if the electric utility industry finally evolved such a program as it has needed for years, only to have it flounder on the rocks of that same parochialism which has aided the onslaughts of federal competition for the past 15 years. And yet, who believes implicitly that no member of the industry would act as did the single member of NAM? Some of the most intensive opposition to the industry "public information program" may come from some of the most important systems in the industry. We hope that this will not be the case and that a working agreement can be evolved. For the fact cannot be disputed that the industry must now shoulder its responsibility.

ELECTRICAL WORLD doesn't know whether the proposed program is or is not a sound one. But it is perhaps even more conscious than is the industry of the pitfalls which await the unwary molder of public opinion. And it is acutely aware of the danger in the disunity which remains today, in the face of continuing threats from Washington.

Half Right for the Wrong Reason

A RECENT ISSUE of *Life* magazine adds unsuspected opposition to President Truman's special-session request for a $4,000,000 appropriation for the New Johnsonville steam plant which TVA wants to build.

In assessing the President's anti-inflation program, *Life* finds certain portions of it good, certain portions which should be deferred and certain which are bad—all of these judgments made in the light of today's vastly-inflated currency supply.

The New Johnsonville request *Life* lists among those which should be deferred. The reason: private utilities are now scrambling for materials and equipment.

We think this position is half right—and perhaps for the wrong reason. Certainly, if TVA needed New Johnsonville now and if it were right for TVA to build New Johnsonville at all, then it should have just as much access to the supply of generating equipment as any other power supplier. Until we return to the allocation of power equipment such as prevailed during the war, there could be no excuse for holding off equipment for a government project where government bore the power supply responsibility just because non-government projects were rushing for the same equipment. And the problem is solved anyway by the manufacturer's production schedules.

As we understand the situation, not all the engineering studies have been made which should be made to justify the New Johnsonville plant at its proposed location, built by its proposed builders. The studies which have been made, we understand further, indicate that if area power supply were the determining factor, any new steam capacity in the region would be located anywhere but New Johnsonville. We feel certain this statement of the situation will be widely assailed by those who want New Johnsonville built by TVA and where TVA has spotted it. Still, the statement comes from sources which are at least the equal of TVA in technical knowledge and which at the very least, have no more special interest in halting New Johnsonville than TVA has in building it.

That's the sorriest part of the whole New Johnsonville scramble. No one yet has turned up with an entirely competent and entirely disinterested judgment on the matter. Nor is such judgment readily to be found.

As for the question of whether TVA should build New Johnsonville at all, we retain our stated conviction that it should not. We continue to believe that the government should not be in the power business. And if government shall continue in the business, then government should equalize the rules under which privately-owned and publicly-owned power suppliers do business. Clearly, failure to do so can only result, over the long term, in eradication of that supplier who is forced to bear burdens not required of a competitor. It follows that New Johnsonville may be used as a device for extending the area in which unequal competition is sponsored by the government. If such is the case, it should be halted and private industry asked to provide needed capacity.

Allocating Service Costs

ONE HOT SUBJECT in the regulation of utility rates is this: How far can a utility go in basing rates upon the allocated cost of serving particular classes of customers? Even if this broad and controversal question were solved, there would be a substantial difference of opinion over the theories of allocating such costs among residential, commercial, and industrial customers.

Chairman Milo R. Maltbie of the New York Commission, long has advocated the idea that a utility should not submit new rate schedules without proof of the reasonableness of each. He has finally forced Consolidated Edison Co to make a complete cost allocation. The extent to which weight will be given the studies of the Edison Co still is to be determined. Of particular interest, however, is the fact that such a study has been made and submitted in testimony at a public rate hearing.

It would be foolish indeed to assume that this method of evaluating the reasonableness of rate schedules will not be picked up by other commissions and perhaps forced upon unwilling utilities. Therefore, the important consideration for a utility is the need for guiding the user of such cost allocation so that no greater injustice is done the customer by using it than results from failing to use it.

One rational basis for interpreting such studies is indicated in the article by H. J. Flagg which appears in this issue of ELECTRICAL WORLD.

Simplicity in Rate Making

ONE MONTH AGO, the District of Columbia's Public Utilities Commission issued an order approving rates submitted by the Potomac Electric Power Co. These involved major changes in the company's rate structure. The importance of this order lies not alone in the increased revenues it permitted. Equally important is the extent to which it permitted rates to be simplified.

Old and obsolete rate forms did not exist only in Washington; they are present everywhere. They can be eliminated only through the conscientious efforts of the rate engineer, the sympathetic cooperation of management and the intelligent decisions of regulatory commissions. This is true because the abandonment of obsolete rates invariably hurts some customers.

In Washington, eight rate schedules were reduced to four; immaterial matter was removed from the schedules; ratchets and minimum annual demand charges were eliminated; unnecessary rate blocks were excluded; and it was specified that residential and commercial customers' use be read and billed in units of 10 kwhrs.

Now arises the opportunity to do the great job that the rate engineer and the commercial manager have always dreamed of. That is the production of a simple rate form which can be understood by all without losing the ability to charge in accordance with the cost of service. Many rate changes are now in the planning stage. It will be unfortunate indeed if the utilities and the commissions alike lose the chance to do a great service to the public.

NEWS OF THE ELECTRICAL WORLD

The Electrical Week

The shake-up that comes, sooner or later, to all federal agencies has come to the Atomic Energy Commission. Changes in policy have come with important ones in personnel. Most significant is the new policy to speed up the power development program. . . The U. S. is importing more from other nations, exporting less to them. So far this is not too important, but a drop in domestic business will make it so. . . In the Northwest, public power advocates still see the need for more dams and hydro plants. They also foresee Congress forcing BPA to halt sales to PUD's which have acquired privately owned utilities without the approval of the voters.

Workers at the Buffalo plant of the Westinghouse Electric Corp have been given a gentle hint to get to work. In a press conference, General Manager Leon R. Ludwig revealed that the plant is losing money because production is less than 70% of that anticipated.

Any change in the Taft-Hartley Act which may be recommended by the joint "watchdog" committee established to monitor the law will be included in its final report due Jan 2. In addition to studying how the law works, the committee also must study a number of problems which arise under collective bargaining. Among these are "means by which an employee may achieve greater productivity and higher wages, including plans for guaranteed annual wages, incentive profit-sharing and bonus system."

Stand aside John L. Lewis. The Philippine Supreme Court has upheld a Court of Industrial Relations decision that workers on the night shift are entitled to a 50% raise over daytime wages. The workers involved are oil company employees.

Note to White House speech writers: In his address to Congress on July 27, the President recommended approval of the "St. Lawrence Waterway Treaty." In April, 1947, Truman withdrew the only existing St. Lawrence "Treaty." Of course, he should have said "the St. Lawrence Waterway Agreement," a Canadian-U. S. accord which still has life, though not much.

FPC estimates that upwards of 80,000,000 kw of generating capacity are potentially available at water power sites in the nation which are capable of economic development.

A Phoenix, Ariz., concern is trying to interest small investors in a new invention, called "Man's Greatest Need." The new invention is a "good, economical process" for desalting sea water. The question of electric utilities is, "How many kilowatts will the process take?"

Public and private power seem to be trying to outdo each other in getting electricity to the farmer and in telling him what to do with it after he has it. Are city people supposed to be smarter or are they just considered to be foreigners?

Standard-size washer sales in 1948 had passed the 1946 total by June, and were 30% ahead of 1947 sales for the same period. But the manufacturers are becoming worried by the shortage of enameling steel, used in ranges, refrigerators and many other appliances. The Commerce Department's program allocating this steel for pre-fab dwellings is blamed for the increasing stringency.

The United States has more than one-fourth of the world's developed hydro-electric power, according to the U. S. Geological Survey. World hydro capacity has increased 276 percent since 1920, to a total of 86,900,000 hp. This country has 24,206,000 hp. now and plans for putting that much more on the Columbia alone.

A Westinghouse subsidiary has petitioned FCC for a channel for the first commercial Stratovision station in the world. Stratovision is the name given to the retelecasting of television programs from an air liner.

City residents in Australia now refer to themselves as "the great unwashed." It's winter now "down under," and electricity and gas are so severely rationed that they are too much of a luxury to waste on heating water for washing.

First AEC Reorganization Bringing Changes in Policy and Personnel

THE ATOMIC ENERGY COMMISSION is getting its first major shake-up since the atom program was put in civilian hands a year and a half ago. With a minimum of publicity, these things are being done:

1. The lagging power development program is being reorganized, centralized, speeded up.
2. The agency's whole organization chart is being revamped, with new lines of authority.
3. Many of AEC's top administrative people are on their way out.
4. AEC relations with the military atom-power projects—NEPA and NEPS—are being straightened out. This has already precipitated a rather bitter fight with the Navy.

Why are these changes being made now?

Clear Decks for Republicans

Partly, of course, it's the normal reshuffle to be expected when a new agency has had time to "shake down." More significantly, it's a process of clearing the decks for next January's expected encounter with a Dewey administration. The commissioners are in office until June, 1950, but they'll have to get along with an administration inclined to skepticism about a hold-over agency.

In addition, the move seems to have been precipitated by increasingly vigorous criticism of AEC's rather lackadaisical attitude toward power development. The criticism comes from two sources: The military who feel they've had little or no cooperation from AEC in developing atomic engines for aircraft and ships; and the Commission's Industry Advisory Committee, which has just completed a thorough examination of AEC operations and is now drafting a final report.

Shugg Takes Over Administration

The personnel changes are drastic, and start at the general manager's office. All that's been announced is the appointment of a new deputy manager—Carleton Shugg, who has been in charge of the Hanford plutonium plant. Actually, Shugg will take over nearly all General Manager Carroll Wilson's administrative duties. This is supposed to free Wilson for ivory-tower policy thinking; however, observers familiar with Washington's "kick-'em-upstairs" technique are assuming that Wilson will soon be looking for another job.

Shugg is one of the ablest of the AEC's field managers. He's an Annapolis graduate, was active in the navy's submarine development program in the '20's, went into business as a small electrical equipment manufacturer, and during the war built and managed Cramp and Todd shipyards.

At the next level down, the AEC divisions are being completely revamped. Of the five operating division heads, only two look likely to survive the reorganization.

Shields Warren's Biology and Medicine Division is collapsed into James Fisk's Research Division. Fisk himself will be leaving AEC shortly.

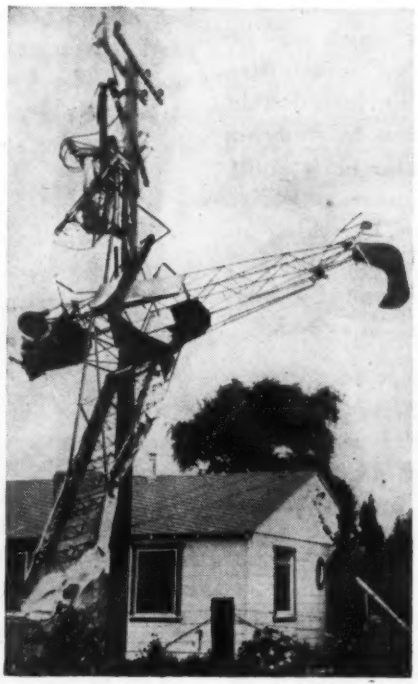
John Gustafson's Raw Material Division is similarly to be collapsed into Walter Williams' Production Division.

The divisions themselves get a new role. Previously, they were simply staff organizations; the five AEC field offices reported directly to the general manager. Now Williams' enlarged Production Division takes direct operating charge of the job of turning out fissionable material—bomb stuff. Hanford, Oak Ridge and the New York raw material procurement office will all report directly to him.

To strengthen the power development program, the old Engineering Division is being converted into a Reactor Development Division, with direct control over the Chicago Argonne Laboratory, where reactor work is now concentrated. The Knolls Atomic Power Laboratory at Schenectady apparently goes under Williams' control. However, in practice, this laboratory has concentrated more on development problems connected with the new plutonium plant at Hanford than on power work. Its future role is uncertain.

R. S. Warner, present head of the engineering division is reported likely to be replaced by someone more familiar with the division's new job of reactor development.

This move is in line with recommendations of the Industry Advisory Committee. IAC feels that power development has been held back by the way AEC has spread the problem thinly throughout the organization. IAC has been urging a centralized power division.



UP A POLE is this airplane which was wrecked near Wintersburg, Calif. The pilot who escaped by dropping to ground said wheels of the plane first hit a telephone line. Then the plane catapulted into the transmission lines and caught fire

•

Strikes Follow Non-Union Men to 2 Atomic Plants

The government wrestled with two strikes at widely separated atomic installations this week. Both were in protest against use of non-union workers.

At Knoxville, Tenn., the International Brotherhood of Electrical Workers was to appear in federal court on Thursday to show cause why an injunction should not be issued to break a strike of 100 utility line and trouble-men in progress since the end of July at nearby Oak Ridge.

The injunction was sought by the National Labor Relations Board after Roane-Anderson Co, which operates Oak Ridge utilities under contract with the Atomic Energy Commission, charged the union with a secondary boycott. Local 760, IBEW, was accused of inducing 30 linemen and 69 building maintenance electricians not to work for Roane-Anderson because it let a subcontract to Kiser Electric Co, Knoxville. The Kiser firm, engaged to change the lighting system at a school, does not employ union labor, NLRB said.

The union, denying there was a strike, insisted that the workers quit individually and voluntarily.

At Los Alamos, N. M. Federal Conciliator Frank J. Ashe sought at midweek to end a week-old walkout of some 3,000 AFL workers employed by five contractors. The men "went fishing" because a sixth contractor, Brown

Root Construction Co, Houston, Tex., employed 115 non-union workers.

In a telegram seeking help from AFL President William Green, AEC warned that the walkout "cannot continue for long without causing serious damage to the nation's atomic weapons program." AEC said the strikers were employed on maintenance and service operations and also on construction of new and expanding "facilities for the nation's atomic defenses."

It also pointed out that AFL officials had not sought, through peaceful procedures available to them, to obtain bargaining rights for the non-union workers.

On June 18, President Truman told Congress he would appoint a commission of labor relations experts to study the problem of maintaining continuity of operations on atomic production. This has not yet been done.

•

Indianapolis P&L to Add 3rd Unit at White River

Indianapolis Power & Light Co has placed an order for a third 40,000-kw turbogenerator for its White River Plant, about 18 miles southwest of Indianapolis. The first unit is to go in operation next March, the second by May, 1950, and the one just ordered by May, 1951.

The cost of the third unit is estimated at $7,600,000, including turbogenerator, necessary buildings, boiler, various other auxiliaries, and a transmission line to Indianapolis. Approximately $14,000,000 is being spent on the first two units and their transmission facilities.

Completion of the three White River units will give the Indianapolis system a total rated capacity of 379,000 kw. Although plant capacity has been increased as rapidly as possible, the margin of capacity over peak demands has been diminishing as a result of the unusually heavy electric loads that have developed since the war. The greatest demand to date has been 245,000 kw reached this summer. The present 259,000-kw capacity should be sufficient to supply the system until the first White River unit goes on the line.

•

Utility Adding 3 Diesels

Arizona Edison Co will install three natural gas driven diesel electric generating units in a plant at Yuma. Total capacity of the units will be 5,000 kw. They will be installed in a new building and are to be ready to meet demands in summer of 1949.

Worcester Evening Gazette Photo

MAYOR C. F. JEFF SULLIVAN, of Worcester, Mass., takes the controls of the steam shovel to break ground for an addition to the Webster Street Plant of the Worcester County Electric Co. Standing at the side of the cab is President John West. Looking up is C. S. Herrmann, chairman, New England Electric System. A 30,000-kw unit will be added

Backing for St. Lawrence Hydro Project Growing

Development of St. Lawrence hydroelectric power by the State of New York and Canada's Province of Ontario is nearing reality. Shortly before the Aug 26 deadline, the Federal Power Commission had received no formal protests on the proposal.

But strong backing has developed for the plans submitted to FPC by the New York State Power Authority on July 16. Latest boost for the New York-Ontario project was a letter to FPC from Gov. Thomas E. Dewey, urging the Commission to issue NYPA a license for hydro development on the U. S. side of the International Rapids "without delay."

The Dewey appeal was in the form of a reply to a routing request by FPC to the State of New York for comment on the proposal. Governor Dewey's support therefor was announced previously, but his personal reply to the Commission query was unexpected. He termed the project "urgent and vital" to the St. Lawrence area and "of utmost significance to the national defense."

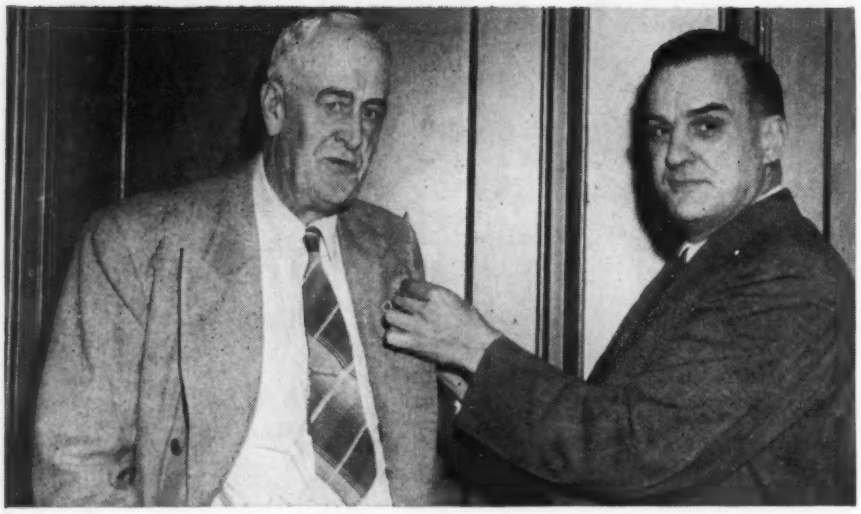
Earlier, FPC had been urged by Sen Robert F. Wagner, New York Democrat, to speed its consideration of the license application.

FPC is expected to hold hearings on the proposal, though it is not required to do so unless consequential opposition develops. Approval by the Commission would be tantamount to U. S. approval of the plans, which call for New York and Ontario to share the construction costs equally. Final okay by the International Joint Commission also is required, but it is expected that IJC will consider only areas of controversy, if any, between U. S. and Canadian interests involved.

•

Building Plans Revealed

Because of the large increase in customers, up 41% in Oregon this year, the Portland General Electric Co has announced a construction and improvement program in the Willamette valley calling for expenditure of $1,070,000. Plans call for expenditure of $640,000 for major items of construction work and substation additions and $430,000 for customer service improvement. Largest single item in the program is an addition and improvements to the Salem oil-fired generation station.



GEORGE S. WILLIAMS executive vice-president of Central Maine Power Co, receives a 45-year service pin from President William F. Wyman. Both are sons of pioneer utility men

U. S. Imports Increasing, Exports Falling As Rest of World Recovers

THE UNITED STATES is buying more from abroad and selling less to the rest of the world. Foreign trade figures prove this. And foreign trade experts give these reasons:

1. Many foreign countries have recovered, or nearly so, from the effects of the war. They can again supply most of their own needs or else secure them from another nation similarly recovered.

2. Many countries would like to import from the U.S., but they just haven't the necessary dollars.

3. Americans and American industries still are short of many materials which either can't be produced here or else haven't been produced in sufficient quantities to supply the demand.

For American manufacturers today the growing imports are no menace, may even be a relief. Tomorrow the story may be different. Then the imports may mean idle factories.

For American utilities, the situation is similar. To some utilities idle factories today would be a blessing, a welcome reduction in load. Tomorrow when all the planned generators will have gone on the line, it will mean increased selling to develop load to bring in the added revenues necessary to pay for the generators. It will also mean idle workers who will buy fewer appliances and use less electricity.

In the first half of 1948, the U.S. exported $6,600,000.000 of merchandise to the rest of the world, 17% below the same period a year ago. Since prices were generally rising throughout the period, the actual drop in terms of volume was perhaps 20%.

At $3,500,000,000, imports during the six months were 22% higher than year-ago levels. Even allowing for higher prices, the first-half gains were real.

In June, exports were down for the third month in a row, but Marshall Plan deliveries over the balance of the year are expected to check the decline. For the year as a whole, exports should be no more than 10% below 1947's record-breaking total of $15,300,000,000.

Imports are another matter. Except for April, they've been climbing month by month and in June were not far from the record high set last March ($666,-000,000). The outlook is that in 1948 they will total $7.000,000,000 or better, some 23% ahead of last year.

On the export side, the decrease has come in nearly all classes of products and materials. Exports of raw cotton, coal, rubber products, and cotton manufactures were off between 30 and 40%. Unmanufactured tobacco exports were off 45%. Crude foodstuffs were off only 14%. Close behind were semi- and finished manufactures, each of which was down about 15% as compared with the first half of 1947.

These two classes continued to account for more than 75% of all exports. They represent the machinery and vehicles, the leather and chemicals the iron, steel, and non-ferrous products for which a dollar-short world must still turn to the U.S.

Some commodities countered the general downtrend. Agricultural equipment jumped 29% to $195,000,000. Because of hard necessity, foreign countries are willing to forego other purchases in favor of these.

Crude petroleum exports also held up well. Steel exports dropped 25% even though the world was willing to make sacrifices to get the metal. The answer to this is the restrictions placed on steel exports by Congress early this year. American industry also needed the steel.

The initial half of 1948 brought plus signs for all economic classes of imports. Manufactured foodstuffs rose only 7%, but in other classes the plus signs were big. Crude materials were up 17%, crude foodstuffs 23%, and semi- and manufactured manufactures were each up by almost one-third. The forces at work here were steady economic recovery abroad, our lowered tariff barriers, and continued high wages.

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Tramway Must Precede French Hydro Project

Building a hydroelectric project in any country is a difficult job. But Electricite de France will build one at Argentat on the Dordogne River that will be doubly difficult. Construction of a five-mile aerial tramway must precede any work on the project itself.

The tramway will be used for hauling sand and gravel to be used in making concrete for the Chastang Dam. The material will be hauled in 185 buckets riding on track cables supported by 40 steel structures from 15 to 86 ft high, and spaced along a 24,100-ft course. Because of the difference in elevation, the site is in the Auvergne Mountains, the loaded buckets will rise 1,082 ft, then descend 623 ft, resulting in a total rise between terminals of 459 ft. Near the discharge terminal, the buckets will cross the river valley on a 2,400-ft span. At one point they will be 230 ft above the river.

The buckets, each of 3,600-lb capacity, will be spaced 294 ft apart. Total capacity will be 198 net tons per hour. The tramway will be built by the American Steel & Wire Co.

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C. E. Groesbeck Dies

Clarence E. Groesbeck, formerly chairman of the board of the Electric Bond & Share Co, New York, died on August 21 at his home in La Jolla, Calif. He was 72 years old. Mr Groesbeck relinquished the board chairmanship in 1944, when he became chairman of the utility holding company's executive committee. He retired two years later but remained a director.

Needs of Northwest Public Power Interests Discussed at Meeting

THE NEEDS of and the dangers to public power in the Northwest received close consideration as the Northwest Public Power Association held its annual meeting recently at Port Angeles, Wash.

Col Theron D. Weaver, division Army engineer, told the meeting of a program to furnish 7,000,000 kw of additional power to the Columbia Basin and to provide flood control. More than a score of dams are under consideration for inclusion in a recommendation to be made this fall by the Army Engineers, he said.

Among the most important dams "being favorably considered" are the Hell's Canyon Dam on the Snake River about 111 miles upstream from Lewiston, Idaho, which would provide 850,000 kw, and Priest Rapids Dam on the Columbia River above Pasco, Wash., which would provide 1,200,000 kw. Libby Dam on the Kootenai River in western Montana, the John Day project on the Lower Columbia, and Albeni Falls Dam on the Pend Oreille River in northern Idaho also were mentioned.

The Albeni Falls Dam is needed if the nine generators to be installed at Grand Coulee Dam between 1949 and 1951 are to be effective, Gus Norwood, executive secretary of the association, declared. Completion of Hungry Horse Dam late in 1952 would level the flow of the Columbia enough for six generators, he said, but Albeni Falls will be needed to bring the remaining three into operation.

Rep Henry M. Jackson, Washington, warned the delegates that the region's public power program "faces a real and present danger in the coming session of Congress." He predicted the danger to public power will come in the form of riders to appropriation bills which might ban any funds to Bonneville Power Administration if it sells power to a public utility district which acquired private utility properties without a vote of the people.

Carl C. Moore, manager of the Stevens County Electric Cooperative, Colville, Wash., was elected president of the association.

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30-Year Franchise Granted

South Bay, Fla., has granted Florida Power & Light Co a 30-year franchise. The utility must pay a 6% revenue tax on all commercial and residential income less taxes paid to the town.

E. H. Royce Photo

ALMOST READY for service is the 5,000-kw hydro plant of the Public Electric Light Co. The plant is on the Lamoille River near St. Albans, Vermont. The vertical unit is designed to run on 50-ft head. The installation is constructed for automatic operation

NSRB Studying Power Resources for Aluminum

Can more electric power be supplied for aluminum production and, if so, at what cost? This double-barreled problem thus far has stumped a 12-man industry-government group advising the National Security Resources Board, it is reported.

The group, which is cooperating with Edward Falck, chief of NSRB's Power and Utilities Division, is drafting preliminary reports. These followed studies of present aluminum production, the availability of additional power in the immediate future. and long-range requirements.

Principal stumbling block confronting the group is the insistence of aluminum producers on maintaining the present low price of aluminum, it is reported. Aluminum industry spokesmen say that fabricators will not purchase the metal if production cost is increased to reflect use of more expensive power.

The NSRB advisors will meet in Washington Sept 8, in an effort to complete their reports. On Sept 9 and 10, they will meet with representatives of the aluminum production industry.

Members of the advisory group are J. E. Moore, Ebasco Services; V. M. Marquis, American Gas & Electric Service; H. J. Scholz, Commonwealth & Southern Corp; Charles M. Custer, Southwest Power Pool; E. S. Bundy, Buffalo Niagara Electric Corp; Robert Brandt, New England Power Co; Walter Dreyer, Pacific Gas & Electric Co; Francis L. Adams, Federal Power Commission; Barclay J. Sickler, Bonneville Power Administration; R. A. Kampmeier, Tennessee Valley Authority; Ben Creim, Bureau of Reclamation; and J. Warren McLaughlin, Munitions Board.

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Detroit Edison Will Get 3 Largest Transformers

Three of the highest rated transformers ever made will be built by General Electric Co for the Detroit Edison Co. Each of the 3-phase transformers is rated 145,000 kva and is designed to raise voltage from 15.000 to 135,000 v.

Without being the largest transformers in terms of size and weight, they are the largest in terms of electrical rating, General Electric Co states. Use of cold-rolled, grain oriented silicon steel for the magnetic cores and forced, directed flow of the cooling liquid reduces the weight of the transformer to about 75% of a comparable self-cooled unit.

POLICEMAN at the Philadelphia plant of Proctor Electric Co fails to break picket line of striking United Electrical, Radio & Machine Workers, CIO, members. Police were aiding non-striking office workers into the plant. Union is seeking a pay raise

Reclamation-Congress Row over Funds Goes On

Reclamation Bureau's running fight with the Republican-controlled Congress over money for Missouri Basin projects went into its second round this week. Latest development was a sharp warning from Sen Kenneth Wherry, Nebraska Republican, to the Bureau to heed the "intent" of Congress in spending appropriations in the Basin states.

The battle developed after Interior Secretary Krug warned the Appropriations Committee that appropriated funds were near exhaustion for five Reclamation Bureau jobs (EW, Aug 21, p 4). The Krug announcement pointed out that funds available for the projects were limited, not by the 1949 Interior Appropriations Act itself, but by estimates made by the appropriations committees in their reports on the legislation.

Rep Ben F. Jensen, Iowa Republican, and Senator Wherry, who head House and Senate subcommittees on Interior appropriations, charged Krug and the Bureau with "political maneuvering." They pointed out the Krug predicted money for one project—Boysen Dam, Wyoming—would run out about Nov 15, just a week after the elections.

Jensen remained in Washington after the close of the special session of Congress to reply to Krug. He admonished the Bureau to abide by the "spirit and letter" of the Appropriations Act. But he told reporters that nothing in the law prevented the shifting of appropriated funds from job to job within a single project, like the Missouri Basin. Krug suggested that the Bureau might be "forced" to transfer funds.

Wherry's letter to Krug, however, indicated that he would disapprove such a procedure. The Nebraskan said he did not feel that "the intent of Congress will be met" by a shift of project funds upsetting expenditures prescribed by the appropriations committees.

Commissioner Michael Straus said he still "hoped" to avoid a shutdown of any Reclamation Bureau job before Congress reconvenes. Every effort will be made, he added, to keep work going on the projects cited by Krug—Boysen. Angostura Dam in South Dakota, the Heart River development in North Dakota, Enders Dam in Nebraska, and Kortes Dam, Wyoming.

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Petition Made to Build Plant at Campbell, Mo.

The Missouri Public Service Commission has been asked to authorize construction of a $5,481.500 electric generating plant near Campbell, Mo. The plant would supply power for the Arkansas-Missouri Power Co at Blytheville, Ark.

The application was filed by the St. Francis Electric Generating Co, Little Rock, Ark., a new company organized under the laws of Missouri. It would lease the 33,000-kw plant to Arkansas-Missouri Power until 1978.

The latter utility would have an option to buy the St. Francis common stock at any time after 1953 and would have an option to purchase the plant after 15 years.

Ohio Utility Granted Rate Raise; Funds Impounded

Columbus & Southern Ohio Electric Co has been permitted by Franklin County Common Pleas Judge Joseph M. Clifford to collect a 4.4% increase in electrical rates. However, the money from the increase must be impounded in a Columbus bank to await final outcome of a suit by Columbus against the company. Though the suit affects the capital city, the higher rates became effective Aug 17, in 66 other communities in 22 counties. Some of these communities may also join in the fight against the increase.

Columbus & Southern Ohio issued notice of intent to increase rates on March 29. Columbus claimed it had received "improper notice" since it was not accompanied by the required itemized statement. The section of the 1944 ordinance invoked by the utility was the "variable clause." This allows the utility to raise its rates if, in any calendar year, unit expense per kilowatt hour of energy sold is greater than such expense for 1941 by 5%. The rate of surcharge fixed by the ordinance is four-tenths of 1% for each 1% of increase in production costs. The utility claims expenses are up 11.92% over 1941 and that based on an 11% increase rates should be increased 4.4%.

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Alabama Power Co Signs Up for Gasification Test

Alabama Power Co and the U. S. Bureau of Mines have signed a contract to renew the underground gasification experiments at the Gorgas coal mines of the utility. Land for the experimentation and the administrative and technical organization of the utility will be donated. The government will provide all funds. It has already appropriated $500,000.

It is expected that at least a year will be required before definite conclusions on the results of the new experiments can be reached. The experiments planned will be conducted at a much deeper level than those of over a year ago.

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Maryland PSC Changes

John H. Hessey, Baltimore attorney, has been appointed chairman of the Maryland Public Service Commission. He succeeds Charles B. Bosley, who resigned from the Commission. Frank Harper has been appointed to the Commission to succeed Thomas E. Jones, whose term of office had expired.

2 Firms Trying to Buy Utility in Council Bluffs

Two firms are trying to buy the Western Iowa Power Co. The Council Bluffs utility is now owned by the Omaha (Neb.) Public Power District. The PPD secured the property when it took over the Nebraska Power Co.

One firm is the Southwestern Iowa Power Co, a Council Bluffs organization owned by Post 737, Veterans of Foreign Wars. This is a non-profit group which hopes to acquire the property for eventual public ownership.

The other is the Iowa Power & Light Co, Des Moines, a business-managed utility which has properties near Council Bluffs.

Southwestern has tried to secure an option on the property without success. It is not yet ready to purchase the property. Twice, the City of Council Bluffs was offered the utility for $3,550,000, but no sale resulted. The utility has a franchise in the city which expires Oct 2.

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Electrical League Issues 469 Red Seal Certificates

The Electrical Service League of British Columbia has issued 469 Red Seal certificates during the first half of 1948. Another 297 homes were found to be adequately wired with the exception of range installations.

The League's recommendation for 100-amp main switches, together with three No. 2 service cables, is rapidly becoming standard practice. Dealers have expressed reciation of 100-amp installations which are eliminating the necessity of their having to sell a wiring contract in addition to major appliances.

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TVA Grants Pay Raise

Some 5,400 white collar workers of the Tennessee Valley Authority have received salary increases from $300 to $330 a year. The increases are retroactive to July 11 and correspond to those authorized recently by Congress for civil service employees.

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Utility's Assessment Up

The Kentucky Tax Commission has assessed the properties of the Kentucky Utilities Co at a record high of $46,200,000, an increase of $5,900,000 over last year. The utility also pays local taxes in 79 counties.

DEAUVILLE, France, has installed a neon street lighting system on its main streets

EEI Manual Ready

"Guide for the Selection of Sales Supervisors", a manual which outlines procedures for the assistance of executives charged with the responsibility of choosing salesmen for promotion, is now available from Edison Electric Institute. The manual was prepared by the Institute's Sales Personnel and Training Committee.

One Less River to Boss

Reprints of the article, "One Less River to Boss," which appeared in the Aug 14 issue are available at 20¢ per copy. Address: The Editor, Electrical World, 330 West 42nd St, New York 18, N. Y.

Electric Energy Sales in May Advanced 8.8%

Sales of electric energy to ultimate customers in May 1948 totaled 19,162,732,000 kwhr, the Edison Electric Institute reports. This was an 8.8% increase over the 17,610,274,000 kwhr sold in May 1947.

Revenues from ultimate customers amounted to $341,687,300, compared with $310,024,600 in May 1947, an increase of 10.2%.

Classification of Sales, May

Kilowatthour Sales May	Million KwHr 1948	1947	Percent Change
Residential or domestic	3,913	3,437	+13.9
Rural (distinct rural rates)	452	514	—12.1
Commercial or industrial			
Small light and power	3,382	2,994	+13.0
Large light and power	10,134	9,375	+ 8.1
Street and highway lighting	176	165	+ 6.2
Other public authorities	504	475	+ 6.0
Railways and railroads			
Street and interurban	327	380	—14.0
Electrified steam railroads	220	224	— 1.7
Interdepartmental	55	46	+20.4
Total to ultimate customers	19,163	17,610	+ 8.8

For the 12 months ended May 31, the average use per customer advanced to 1,498 kwhr from 1,377 kwhr for the preceding year, an increase of 8.8%; the average annual bill to $45.55 from $43.38, an increase of 5.0%; revenue per kwhr dropped to 3.04¢ from 3.15¢, a decrease of 3.5%.

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Raver Fights Off Foes, Supports BPA Contracts

Insistence by Dr. Paul J. Raver that Bonneville Power Administration live up to the terms of its contracts with private utilities has brought him under the attack of some public power advocates.

Bert Heggen, president of the Washington Public Utility Commissioners Association, is one of these. He wants Dr Raver to break power contracts which BPA has with private utilities and to use this power for serving new or enlarged public utility districts.

Dr Raver maintains that:

1. A contract is a contract and is legally enforceable, regardless of differences of opinion as to its wisdom.

2. Members of the public served by private power corporations are just as much entitled to federal power's benefits as those served by local public agencies. Otherwise municipal ownership cities like Seattle and Tacoma might squeeze out cities served, as is Spokane, by long established private corporations.

SEC RULINGS

LOUISVILLE GAS & ELECTRIC Co (Del.) received the green light for its liquidation plan when SEC reaffirmed its approval of the program. SEC had previously approved the plan, but the U. S. District Court of Delaware sent the plan back to the commission for further consideration. The plan provides for the distribution of the company's principal assets, consisting of 918,025 shares of common stock of its subsidiary, Louisville Gas & Electric Co. (Ky.), among the Delaware company's Class A and Class B stockholders. This distribution will be made at the rate of 1¼ share for each share of Class B stock. (Release No. 8404).

WISCONSIN PUBLIC SERVICE Corp has received clearance for the issuance and sale of $5,250,000 of first mortgage bonds, due in 1978. The company is a subsidiary of Standard Power & Light Corp. The bonds are to be offered at competitive bidding. (Release No. 8407).

AMERICAN LIGHT & TRACTION Co's proposal to sell 190,000 shares of the common stock of Detroit Edison Co, contained in the application-declaration filed by American Light and United Light & Railways Co, has been ordered severed from the other transactions proposed in the application-declaration. It is further ordered that the sale not be consummated until the results of the competitive bidding have been made a matter of record in these proceedings. (Release No. 8408).

UNITED CORP's amended plan for retirement of its outstanding preference stock in accordance with the Commission's decision of Aug 4, has been approved. An application for enforcement of the plan has been filed with the District Court in Wilmington. United's plan for retirement of its preference stock had called for the distribution to the holder of each share of such stock: (1) One share of Public Service Electric & Gas Co common and one-tenth share of South Jersey Gas Co common; (2) one share of Columbia Gas & Electric Corp common; (3) One-fourth share of the Cincinnati Gas & Electric Co common; (4) $6 in cash. Under the amended plan, distribution of the one-tenth share of South Jersey common is eliminated and the distribution of the Cincinnati Gas common is increased from one-fourth to three-tenths of a share. U. S. District Judge Paul Leahy at Wilmington set Sept 28 for a hearing on an SEC application to enforce a plan for retirement of the $3 cumulative preference stock of United Corp. (Release No. 8409).

ASSOCIATED GENERAL UTILITIES Co was given a new status when the SEC revoked an order issued in 1939 which held that it was a subsidiary of the Associated Gas & Electric Co and the Associated Gas & Electric Corp, predecessors of the General Public Utilities Corp. The commission's action in 1939 was based upon its finding that the management and policies of Associated General Utilities at that time were subject to such a controlling influence by the Associated Gas companies as to make it appropriate that General Utilities be subject to the obligations, duties and liabilities imposed by the Holding Company Act upon subsidiaries of holding companies. Reversal of its 1939 finding, the commission said, was based on the fact that it found none of the stock of Associated General Utilities is now held by General Public Utilities or its subsidiaries, although debt securities of the former, in the amount of $351,307, are owned by the latter. SEC also found that none of the officers and directors of Associated General Utilities is presently employed by or has any connection with General Public Utilities. (Release No. 8414).

SOUTHERN INDIANA GAS & ELECTRIC Co has been authorized to issue $1,000,000 of first mortage bonds, 3% series, due 1978, to institutional investors at 99.80% plus accrued interest. Proceeds estimated at $984,525, will be used to provide a portion of the funds required for the construction or acquisition of permanent improvements, extensions and additions to its property or to reimburse its treasury in part for expenditures made for such purposes. (Release No. 8416).

NORTHERN DEVELOPMENT CORP's merger into the Central New York Power Corp has been approved. Both companies are subsidiaries of the Niagara Hudson Power Corp. Niagara Hudson proposes to sell to Central New York all of the 182,000 outstanding shares of capital stock, no par value, of Northern Development. In consideration for these shares, Central New York will issue 250,000 additional shares of its no par value common stock to Niagara Hudson. Upon completion of these exchanges Northern Development will be merged into Central New York. (Release No. 8422).

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Will Limit Energy Use

Restrictions on the use of electricity are coming back to Ontario. They will be back in some form this fall. Robert H. Saunders, chairman of the Hydro-Electric Power Commission of Ontario, has so notified the mayors of cities in the Toronto area. He attributed the coming restrictions on the lack of rainfall in Ontario and Quebec.

MEETINGS

Interstate Power Club of New York—Meeting, Hotel Martinque, New York, September 20. E. L. Huse, secretary, Jersey Central Power & Light Co., Morristown, N. J.

Pennsylvania Electric Association—Prime Movers Committee, Carver House, Warren, Pa., October 28-29. John W. Mikels, vice-chairman, Pennsylvania Power Co, New Castle, Pa.

National Electrical Contractors Association—Annual Meeting, Roney Plaza Hotel, Miami, Fla., November 30-December 3. Paul M. Geary, executive vice-president, 1200 18th St, Washington 6, D. C.

PREVIOUSLY LISTED

American Society of Mechanical Engineers—Fall Meeting, Reed College and Heathman Hotel, Portland, Ore., September 7-9; Annual Meeting, Hotels Pennsylvania and New Yorker, New York, November 28-December 3.

Rocky Mountain Electrical League—Annual Convention, Hotel Colorado, Glenwood Springs, Colo., September 12-15.

International Brotherhood of Electrical Workers—Annual Convention, Ritz-Carlton Hotel, Atlantic City, September 13-17.

Instrument Society of America—National Instrument Conference and Exhibit, Philadelphia Convention Hall, Philadelphia, September 13-17.

Southeastern Electric Exchange—Engineering and Operations Section, Vanderbilt Hotel, Asheville, N. C., September 16-17; Accounting Section, Sir Walter Hotel, Raleigh, N. C., October 28-29; General Sales Conference, Atlanta Biltmore Hotel, Atlanta, Ga., November 10-12.

Iowa Utilities Association—Conference, Fort Des Moines Hotel, Des Moines, Iowa, September 20-21.

Illuminating Engineering Society—National Conference, Statler Hotel, Boston, September 20-24.

Missouri Valley Electric Association—Personnel Administration Committee, September 21; Rate Practice Group, October 7; Power Sales Committee, October 15; all at Hotel President, Kansas City, Mo.; Accounting Conference, Connor Hotel, Joplin, Mo., October 21-22; Engineering Committee, Hotel President, Kansas City, Mo., October 26; Rural Round Table, The Elms, Excelsior Springs, Mo., October 27; Sales and Rural Conference, The Elms, Excelsior Springs, Mo., October 28-29.

Pennsylvania Electric Association—Annual Meeting, William Penn Hotel, Pittsburgh, September 21-22; Transmission and Distribution Committee, Bedford Springs Hotel, Bedford, Pa., October 7-8.

Association of Iron and Steel Engineers—Convention and Iron and Steel Exposition, Cleveland Public Auditorium, Cleveland, Ohio, September 28-October 1.

International Association of Electrical Leagues—Annual Conference, Mayflower Hotel, Washington, D. C., September 29-October 2.

Canadian Electrical Manufacturers Association—Annual General Meeting, General Brock Hotel, Niagara Falls, Ont., September 30-October 1.

American Institute of Electrical Engineers—Middle Eastern District Meeting, Statler Hotel, Washington, D. C., October 5-7; Mid-west General Meeting, Hotel Schroeder, Milwaukee, October 18-22; Southern District Meeting, Tutwiler Hotel, Birmingham, Ala., November 3-5.

Edison Electric Institute—Prime Movers Committee, William Penn Hotel, Pittsburgh, October 11-12; Transmission and Distribution Committee, New Ocean House, Swampscott, Mass., October 11-12; Electrical Equipment Committee, William Penn Hotel, Pittsburgh, October 14-15.

Indiana Electric Association—Annual Convention, French Lick Springs Hotel, French Lick, Ind., October 13-15.

Electrochemical Society—Fall Congress, Hotel Pennsylvania, New York, October 13-16.

Utility Workers Union of America—National Convention, Washington Hotel, Washington, D. C., October 15-17.

Wisconsin Utilities Association—Commercial and Technical Divisions of Electric and Gas Sections, Pfister Hotel, Milwaukee, November 1-3.

National Electronics Conference—Edgewater Beach Hotel, Chicago, November 4-6.

Public Utilities Association of the Virginias—Annual Meeting, Greenbrier Hotel, White Sulphur Springs, West Virginia, November 5-6.

National Electrical Manufacturers Association—Annual Meeting, Hotel Traymore, Atlantic City, November 8-13.

National Farm Electrification Conference—Congress Hotel, Chicago, November 17-19.

National Exposition of Power and Mechanical Engineering—Grand Central Palace, New York, November 29-December 4.

Plumbers Return to Work On Georgia Power Plant

After a six-week strike, members of the AFL Plumbers & Steamfitters Union, have gone back to work at Plant Atkinson of the Georgia Power Co. The utility, which is adding a 60,000-kw unit, was not involved. However, operation of the plant has been delayed at least a month.

The union struck for a raise to $2.50 an hour. One of the affected contractors was the Grinnell Co which had the contract for the work at Plant Atkinson. This contracting firm has a national agreement with the union to abide by local wage scales. This led to an agreement under which the union men have returned to work at $2.25 an hour. The men will get retroactive wage increases if the union wins higher wages.

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Electricity Used to Dry Mud and Prevent Slides

The use of electricity to prevent mudslides has proved successful in a test at Calgary, Alberta. The test was carried out on a steep hill threatening more than a score of Calgary homes. Direct current was forced into the ground through a number of electrodes placed along the brow of the hill. The result was a dry barrier which held the earth in place.

A German scientist invented the system used. It was first used by the Germans in constructing submarine pens at Trondheim, Norway, during the last war.

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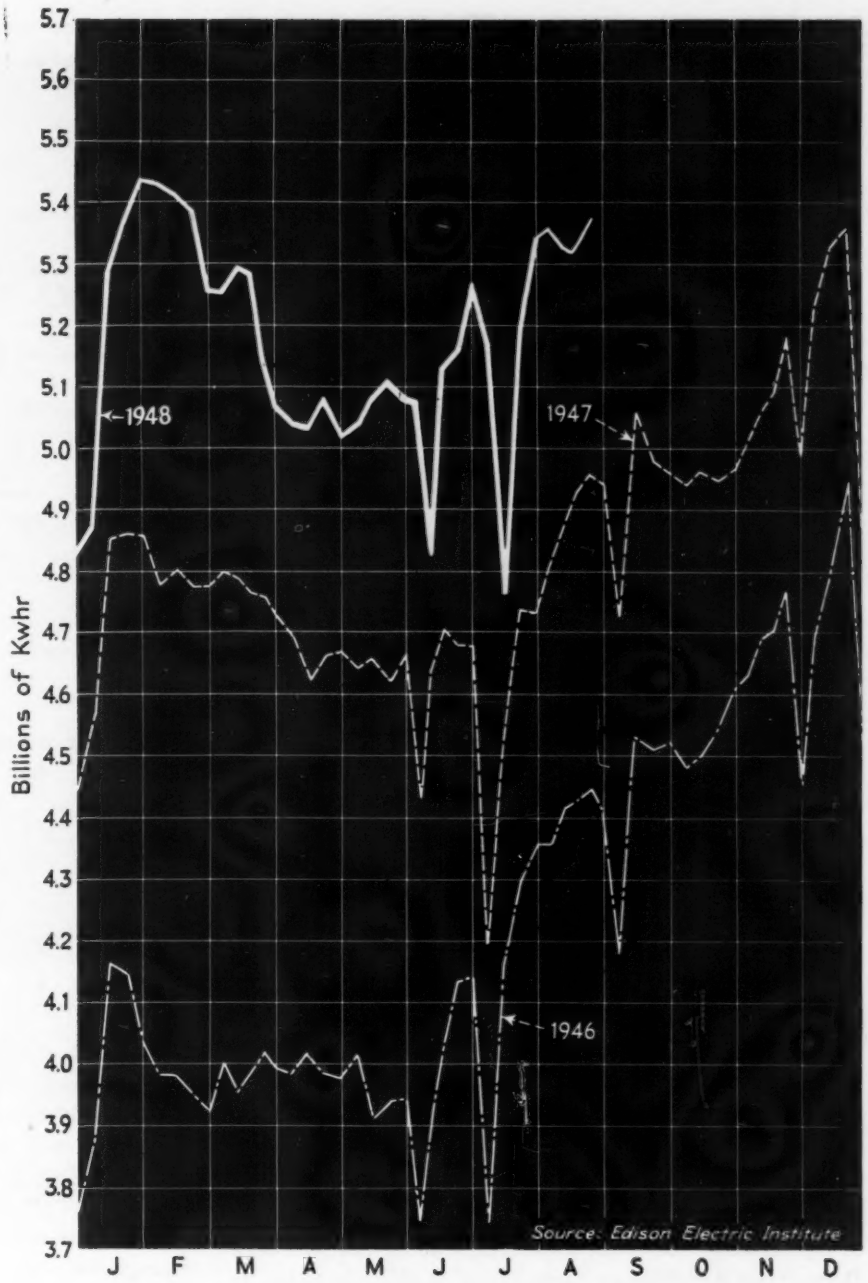
138-Kv Line Planned

Kentucky Utilities Co is building a 138-kv transmission line, 140 miles long. The $2,000,000 line will connect the Dix Dam Plant in central Kentucky with a plant now under construction on the Green River in the western part of the state. The line is to be energized in October, 1949.

Other News

New Equipment	Page 110
News About People	119
Manufacturers & Markets	122
Construction	124
Recent Rate Changes	125



Arput's Peak Highest and Still Growing

"It beats all," sighed ARPUT, looking up from *The Times*. "Here are four guys from Washington state who can't stand the thought that Mt. Ranier is only the fourth highest in the U. S. So they're going to build a 24-foot pile on top, just to edge out two Colorado hills for second place."

"What's the highest," the office boy wanted to know?

"Well," sneered ARPUT, who once lived in Texas, "it says here that Mt. Whitney, in California, of all places, is the highest. But everyone knows that's just an invention of the California Chamber of Commerce. Why, down in Texas we've got hills that . . ."

But somebody else yelled, "The output peak is the highest. It went up again last week and will go even higher."

Weekly Output, Millions Kwhr

1948	1947	1946
Aug. 21 5,391	Aug. 23 4,953	Aug. 24 4,444
Aug. 14 5,318	Aug. 16 4,923	Aug. 17 4,422
Aug. 7 5,319	Aug. 9 4,874	Aug. 10 4,412
July 31 5,352	Aug. 2 4,806	Aug. 3 4,351
July 24 5,342	July 26 4,730	July 27 4,352
July 17 5,197	July 19 4,732	July 20 4,293
July 10 4,760	July 12 4,531	July 13 4,156
July 3 5,166	July 5 4,190	July 6 3,741

Percent Change from Previous Year

	Aug 21	Aug 14	Aug 7
New England	+ 6.9	+ 6.8	+ 8.8
Mid-Atlantic	+ 4.6	+ 3.6	+ 8.1
Central Industrial	+ 7.8	+ 7.6	+ 7.7
West Central	+10.0	+ 9.5	+10.0
Southern States	+11.5	+10.1	+10.7
Rocky Mountain	+10.7	+10.2	+ 9.6
Pacific Coast	+11.3	+ 9.7	+10.0
Total United States	+ 8.8	+ 8.0	+ 9.1

WASHINGTON COMMENT

WILLIAM B. WHICHARD

THE POSITION OF PUBLIC POWER as an issue in the 1948 presidential campaign finally has assumed something approaching measurable proportions. It now is apparent that Harry Truman, at least, rates it after only prices, housing and, possibly, social legislation as a domestic point on which to attack the Republican Congress.

Truman and his Washington aides also have furnished —designedly or otherwise—specially tailored federal power issues for many Democratic candidates fighting to win Senate races. And, from any but the most optimistic Democratic viewpoints, the battle for control of the Senate looks far more promising than the Dewey-Truman tussle. There's more future in it.

Thirty-two Senate seats will be at stake in November, 18 now held by Republicans, 14 by Democrats. Most of the latter, however, are virtually certain to remain in Democratic hands—barring a Dewey landslide. These involve elections in the solid South and other proven Democratic areas. In only three states is there serious thought of ousting Democrats.

At least a half dozen Republican-held seats, on the other hand, are seriously contested. And the Democrats feel they have at least a fighting chance in all races for the Senate west of the Mississippi. They will put up the fight —indeed, they long ago started it.

Truman's $56,000,000 supplemental appropriation bill for federal power projects may or may not have been a bid for western votes. There never was a chance that the special session of Congress would act on it. But it was loaded with funds for states in which Senatorial contests appeared the warmest.

For example, it contained some $4,000,000 in Bureau of Reclamation funds for expenditure in Montana, where Democratic Sen Murray faces a stiff re-election fight. It had $2,775,000 for the Colorado-Big Thompson water and power project. Sen Johnson, Democrat, also has a tough campaign coming up in Colorado. There was also money for Wyoming, where GOP Sen Robertson has tough competition. And so it went.

Next issue-producing development in Washington was the "discovery" by the Reclamation Bureau that it was running short of funds for work on five projects. Two were in Wyoming, one each in the Dakotas and Nebraska. South Dakota already was in the midst of the campaign to elect a successor for retiring Republican Senator Bushfield. Nebraska's Kenneth Wherry, GOP Senate whip, was seeking reelection.

Implications behind both these developments—the supplementary appropriations bid and the Reclamation Bureau announcement—were identical: the GOP Congress refused to make available sufficient funds for power projects in the West. The merits of that contention—or the lack of same—conceivably could be a deciding factor in four Senatorial contests, enough to swing the balance of power in the Senate from one party to the other for the next two years.

TECHNICAL TRENDS

ARCHER E. KNOWLTON

(From papers presented at the recent Conference des grandes Reseaux a Haute Tension in Paris)

Conductor resistance changes about 6% over a 45 F range of temperature. Is this spread, or preferably the top value, always taken into account in voltage-drop studies?

Corona increases the capacitance of a conductor, but hardly affects the inductance. As a consequence the surge impedance is increased and wave velocity decreased.

Extra-high voltage lines should, according to Swedish engineers, be designed and operated to have practically equal voltages at both ends during normal loading.

Corona loss of two-horizontal bundled conductors at 400 kv is about the same at 20 and 40 cm separation but more at 60 cm.

* * * * *

Insulation encounters no tougher foe than tropical exposure. As one exporter put it—if 5 cc of the vulnerable dielectric will still be functionable after 100 hours immersion in 5 cc of 105 C water the material ought to be appropriate for the tropics.

Lead cable sheaths apparently would have improved characteristics of creep and stress-rupture if silver were added up to a 0.0001 content.

DC transmission lacks economic support but the technical feasibility should be broadened by a new multiple-grid thyratron with assertedly unlimited ceilings of voltage current.

Impounded water need not result in mosquitoes and malaria if manipulation of the level exposes the larvae to dryout or to predators at proper intervals.

Mud slides in excavation operations have been checked effectively by *freezing* but the Germans were successful in *drying* out the mass by electrosmosis—merely a case of passing dc between driven electrodes.

Iron-nickel alloy called Permenorm 5000 Z by the Naval Ordnance Laboratory has promising uses in magnetic amplifiers if produced under refined heat control.

Allis-Chalmers Mfg Co Photo

Turbine Manufacturing Capacity Adequate for 7 Years

Composite peak demand for the past 27 years has increased at the average rate of about 6 2/3% compounded annually. On this basis existing turbine manufacturing facilities seem sufficient through 1955

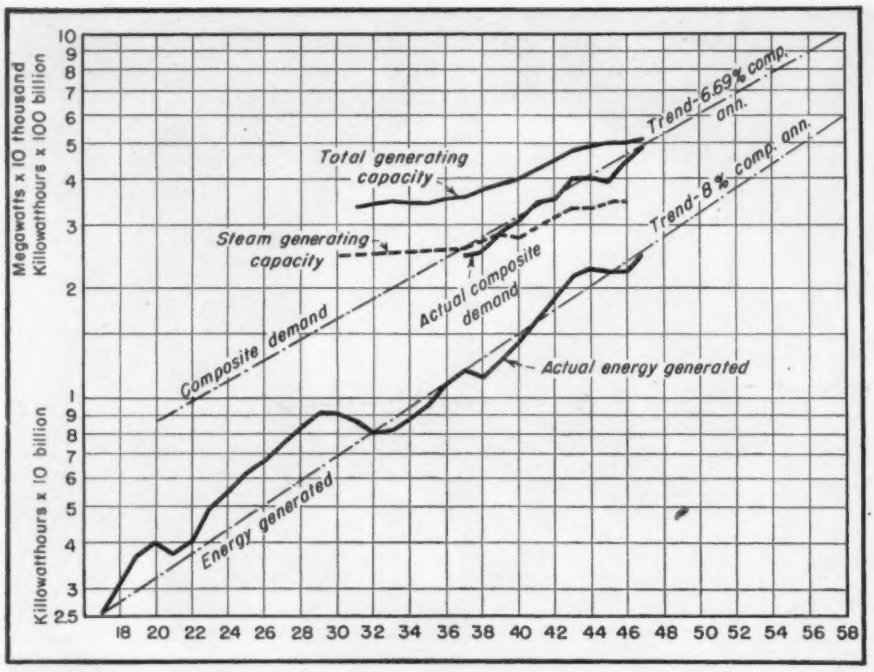
JOSEPH POPE
First Vice President
Stone & Webster Engineering Corporation
New York, N. Y.

"IS the steam turbine manufacturing capacity of the country sufficient to meet the requirements of the electric utility industry, and how long before more reasonable periods between placement of order and shipment of unit can be expected?"

To answer this question requires first some idea of what the utility industry's needs have been and are likely to be in the period ahead.

Some of the important data in the growth of the electric utility industry as far back as reliable information is conveniently available from U. S. Census, Federal Power Commission and Edison Electric Institute sources is shown in Table I. Columns 2, 4, 6 and 8 are respectively the annual energy production, the combined noncoincident peak, the installed generating capacity and the steam power generating capacity. From the data for the first and last years shown, an average rate of growth of each of these items has been computed. Computations are based on the theory that it is a given percentage compounded annually and the corresponding values for intermediate years have been inserted in Columns 3, 5, 7 and 9.

Comparison of the several pairs of columns, and in graph shows that the actual growth did follow the percentage compounded rate rather closely. For instance, energy production has grown at the rate of 8% compounded annually over the last


Megawatts x 10 thousand
Killowatthours x 100 billion
Killowatthours x 10 billion
Total generating capacity
Steam generating capacity
Trend-6.69% comp. ann.
Trend-8% comp. ann.
Actual composite demand
Composite demand
Actual energy generated
Energy generated
10 9 8 7 6 5 4 3 2 1 9 8 7 6 5 4 3 2.5
18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58

HISTORICAL GROWTH RATES of energy, demand and capacity follow annually compounded percentage rates closely

30 years. The composite peak demand has grown 6.697% compounded annually over the last 27 years. The total power plant capacity has increased at the rate of only 2.7% compounded annually over the last 16 years; and the steam power portion of it at the rate of only 2.31% compounded annually. Also, in 1932, there was power station capacity 89% in excess of the maximum load for that year, but in 1947, the surplus was reduced to less than 5%.

Thus, during the worst depression years the industry lived on the large reserve capacity that had previously accumulated for a variety of good reasons. Beginning with 1937, when the excess was still 46%, additions to capacity began to be made again; but, nevertheless, by 1943 the reserve margin had fallen below 20%. This is the date that war time curtailment became wholly effective. Naturally, the plant installation experience of the past fifteen years is no criterion of the future needs of the industry.

TABLE I—Actual Rates of Growth Compared to Calculated Values

1	2	3	4	5	6	7	8	9
	Actual Energy Generated		Composite Demand		Total Generating Capacity		Steam Capacity	
Year	Actual production, Million kwh	8.00%, compounded annually	Actual peak, MW	6.697%, compounded annually	Actual installed capacity, MW	2.70%, compounded annually	Generating capacity, MW	2.31%, compounded annually
1917	25,438	25,438						
18	31 *							
19	37 *							
20	40 *		8,600	8,600				
21	36 *							
22	40,292	37,364	10,250	9,791				
23	50 *							
24	55 *							
25	62 *							
26	67 *							
27	74,686	54,893	16,500	13,538				
28	85 *							
29	91 *							
30	90 *						24,696	24,696
31	86 *				33,698	33,698		
32	79,393	80,645	18,225	18,721	34,387	34,610		
33	81,740	87,104			34,587	35,545		
34	87,258	94,069			34,119	36,507	25,524	26,811
35	95,287	101,591			34,435	37,494		
36	109,316	109,710			35,081	38,508		
37	118,913	118,480	24,700	25,887	35,620	39,550	25,873	28,515
38	113,812	127,963	25,350	27,621	37,492	40,620	27,203	29,107
39	127,642	138,296	28,700	29,470	38,863	41,718	28,047	29,711
40	141,837	149,268	30,800	31,444	39,927	42,846	27,775	30,328
41	164,788	161,182	34,650	33,550	42,405	44,005	29,599	30,957
42	185,979	174,060	35,850	35,797	45,053	45,195	31,169	31,600
43	217,758	187,990	40,100	38,194	47,951	46,418	33,015	32,255
44	228,189	203,023	40,650	40,752	49,189	47,673	33,541	32,925
45	222,486	219,257	39,550	43,481	50,110	48,963	34,113	33,608
46	223,130	236,790	45,000	46,393	50,303	50,287	34,305	34,305
47	255,725	255,725	49,500	49,500	51,647	51,647		

* Read from EEI Chart.

If 6 2/3% Growth Rate Continues

Not even the wisest and best informed prognosticator could have, 27 years ago, synthesized the multitudinous factors that were to affect the then future growth of the electric utility industry and, with any assurance of accuracy, predicted a mean increase in demand equal to about 6-2/3% compounded annually. Yet that is what passing time has revealed.

The period covered includes depressions both great and small, recovery from them ripening into booms, two wars of tremendous magnitude with their postwar reaction and recovery. There would seem to be little else other than variations of these economic phenomena to be expected in the future. Thus, it appears that a prolongation of the historic growth that averages out all the many influences affecting individual companies is as good a prediction as can be developed of the coming average trend of utility load in the United States, including both business managed and public power systems. Accordingly, Table II is anticipated peak load from 1947 to 1960, inclusive, on a continuing basis of 6.697% compounded.

Since energy production does not enter directly into the matter that is being studied here, no forecast is given in Table II. But if it continues to grow at the same 8% rate as in the past, by 1960 the total annual industry production will be 695,450 million kwhr. With a predicted peak of 114,969 megawatts, an annual load factor of 69% is indicated. For the year 1947, it was 59%. If any inference is to be drawn from this, it may be that the forecast of peak demand is conservatively low; particularly as, in recent years, special practices have suppressed peak demands.

In Table II, Column 3 indicates the annual increment of load for which new generating facilities must be provided. In addition, provision must

be made for suitable accompanying reserve capacity. Allowing for the difference between rating and capability of generating equipment, it may be that 12½% of required rated capacity is adequate added reserve; but in 1937 the collective judgment of the industry resumed plant capacity additions when the reserve reached 46%. In addition is the matter of replacement of old equipment. On a 35 year life assumption and the 6.7% rate of annual increase in load, the old equipment to be replaced represents about 11% of that newly required. This makes the total extra for reserve and replacement 25%. Accordingly, Column 4 represents the total new capacity required for load, replacements, and reserve.

TABLE II—Anticipated Growth of Peak Loads on Basis of 6.69% Rate Compounded Annually

1 Year	2 Composite Peak, MW	3 Annual Increment, MW	4 Increment Plus Reserve and Replacement, MW	5 70% Required as Steam Turbine, MW
1947	49,500			
48	52,815	3,315	4,144	2,900
49	56,352	3,537	4,421	3,095
1950	60,126	3,774	4,717	3,302
51	64,152	4,026	5,032	3,522
52	68,449	4,297	5,371	3,830
53	73,033	4,584	5,730	4,011
54	77,924	4,891	6,114	4,280
1955	83,142	5,218	6,522	4,565
56	88,710	5,568	6,960	4,872
57	94,651	5,941	7,426	5,198
58	100,990	6,339	7,924	5,547
59	107,756	6,766	8,457	5,920
1960	114,969	7,213	9,016	6,311

70% in Steam

From Table I it appears that in 1934, of the 36,507 MW of total installed capacity, 25,524 MW or 70% was in steam capacity. In 1946 the ratio was 68.2%.

To be sure, many of the better hydro sites have already been developed and as this field has largely been preempted by the Federal Government, advances in it are subject to the somewhat unpredictable action of the Congress. Drought and the attainment of the limit of hydro development in certain areas are turning both private and public utility groups toward fuel fired power. Equipment on order indicates that a much higher proportion is in the form of steam turbines, nearer 7/8 than 7/10 of the total.

If, therefore, a better ratio between steam and other sources of power in the future is 80%, Column 3 of Table II would show the new required capacity in steam turbine generators. This is, of course, the expected annual increment in load; and the effect of assuming this ratio is that all extra capacity for reserve and replacements is supplied by hydro and other forms of generation.

According to E.E.I. information published in October, 1947, it is expected that additions to generating plant will be 5,215 MW in 1948, 4,915 MW in 1949, and 3,383 MW in 1950. It is probable that the 1950 figure may actually be about 5,000 MW, and that 1951 will follow at the same rate. Assuming no retirements, this would result in a total generating capacity at the end of 1951 of 71,777 MW against a load, as predicted in Table II, of 64,152 MW. Thus, 7,625 MW or 11.9% is excess.

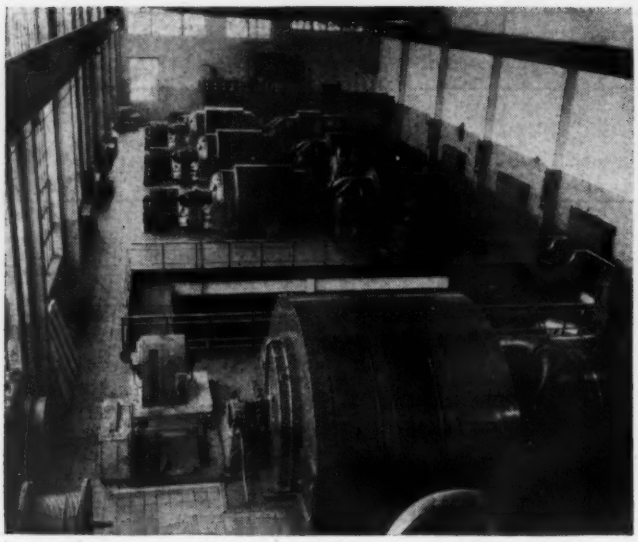
In 1946, orders were placed for 165 steam turbine generators of 10 MW rating and larger, totaling 6,640 MW; and in 1947 for 169 units, totaling 7,319 MW. These are for all users but exclude export. Some nonutility orders are included among these larger sizes, but they are approximately offset by utility company purchases in the smaller categories. Promises of shipment on most of these machines run between 20 months for the earlier 1946 orders and 40 months for those placed about 6 months ago. Shipping periods are now about 36 months. This shortening in delivery is believed not to represent any hiatus in the final production of generating equipment. It is probably due to withholding of orders by customers who will undoubtedly need the apparatus but who are taking time to survey their situation.

Future Outlook

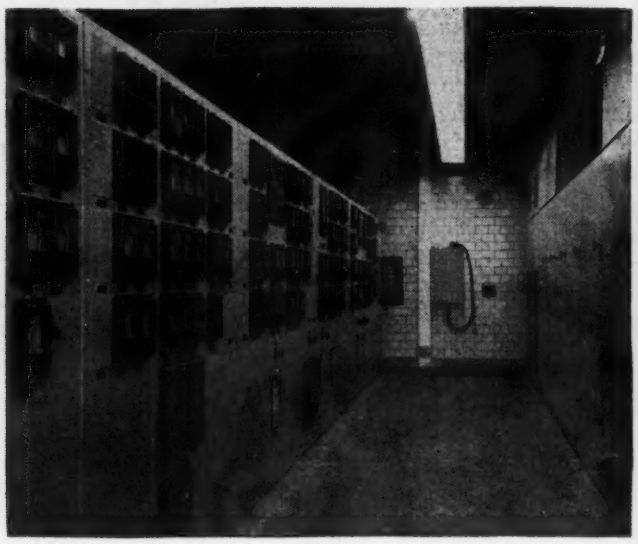
It is probable that all units ordered in 1945 were in service before the end of 1947 and that all ordered in 1946, 1947, and the first quarter of 1948 will be available before the 1951 December peak. This last group amounts to about 15,000 MW in steam turbines. If it represents 70 to 80% of all additions to generating plant, it would check quite well the idea that 1951 should see a reasonable margin of reserve again established. Retirements and the possibility of the actual peak demand in the near future years exceeding the predicted mean growth would, of course, reduce the margin. But apparently the foreseeable future situation is adequately taken care of.

By 1952, the existing manufacturing facilities should be able to produce 5,000 MW in steam turbine generation annually for domestic utility customers, if there are no major interferences to production from strikes or other causes. It appears from Table II that this production rate will not have to be exceeded before 1955, on the basis of 80% of all plant additions being steam turbines; and until 1957 if they form only 70% of all new installations. This would appear to leave time for later consideration of increased shop facilities. Furthermore there may be a period of four to five years, within which it should not be necessary to order a new steam turbine generator more than the two years needed to acquire material and fabricate the unit, before its shipment from the factory. But it is evident that all turbine deliveries can not be scheduled for the summer months so that the unit may be available for the following winter peak.

The combined capacity of the manufacturers does not exceed 9 or 10 units per month. Consequently the utility industry will have to place its orders so that all may be served, and though the 2-year delivery term may hold, orders may still have to be placed more than three years in advance of need. Also during this period the presently unknown demands of E. R. P., and other foreign aid programs for electric generating equipment, will be evidenced. They might well absorb more than the few hundred megawatts of steam turbine manufacturing capacity not needed by United States companies, and revive the scramble for a place in the production line.



OLD CONTROL BOARD at far end of turbine room. Direct-connected exciter being installed on generator in foreground.



SEMI-FLUSH relays, regulators and integrating meters used on rear of control board. Bus F cubicles at right

Outgrown Distribution System Replaced

Chevrolet-Detroit Forge synchronizes generators with Detroit Edison. Breaker capacity, metering, fault limitation and bus protection revamped to meet increased capacity and well-coordinated operation

VICTOR L. DRUMMOND
Electrical Engineer
Chevrolet-Detroit-Forge Division of
General Motors Corp
Detroit, Mich

LIKE MANY OTHER rapidly growing industrial plants Chevrolet—Detroit Forge Division of General Motors Corporation outgrew its power distribution system. Both generating capacity and load increased until the available faults were as high as 500,000 kva in the primary system while the interrupting capacity of the oil circuit breakers was as low as 100,000 kva. Several fires attested to the fact that the switchgear was inadequate. Costly service interruptions, excessive maintenance costs and the lack of facilities for expansion indicated that the system could no longer handle the growing electrical load.

Economy Impeded

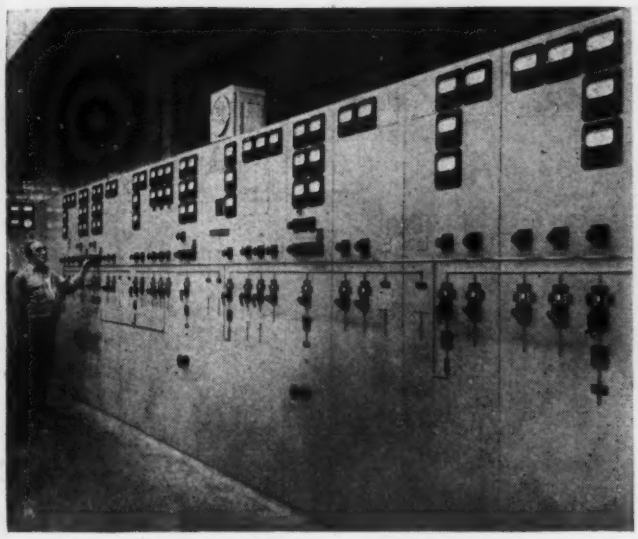
The primary power distribution system consisted of a station bus fed by four generators delivering 22,500 kva at 4,800 volts and a Detroit Edison bus fed by ten 450 MCM cables at 4,800 volts. Load circuits were transferred from one bus to the other by use of double throw knife blade disconnects. The system included long runs of open bus with numerous points of doubtful rupturing strength. It involved serious hazards in operation, required much maintenance and did not lend itself readily to load adjustments which would make for most economical operation of generators.

Chevrolet—Detroit Forge manufactures springs, bumpers, brackets and a large variety of forging ranging in size from small gear blanks to axles and crankshafts. The use of considerable process steam for operation of forging machines makes it possible for the plant to justify its own electrical generating system, which consists of three 4,370 kva generators and one 9,370 kva generator. This capacity takes care of about one half of the plant's electrical load. This system also furnishes power for the neighboring Gear and Axle Division of Chevrolet. Steam is generated at 600 psi and 175 psi. Process steam is distributed to the shop at 110 psi and the exhaust returns to the power plant for use in the low mixed pressure turbines at approximately 10 psi.

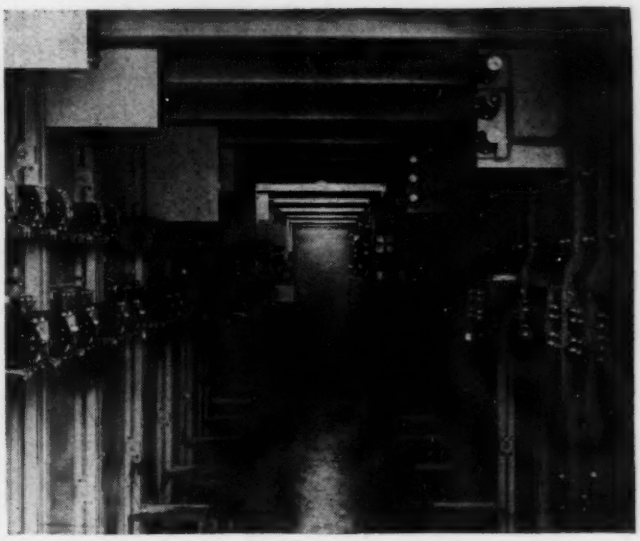
Thus it was necessary to forecast both the electrical load and the steam load. Frequently it was necessary to interrupt service to shift a load from one bus to the other when something happened to alter the plan. The fact that the electrical load does not necessarily vary directly with the steam load helps one appreciate the problem of operating the system most economically.

New System Decided

With the advent of increased postwar loads and the realization that the power distribution facilities were inadequate it was decided to install a new system having a maximum of safety, reliability and flexibility. Albert Kahn, Associated Architects and Engineers of Detroit were commis-



DUPLEX CONTROL BOARD (four sections not shown) has swinging panel with synchronizing instruments at each end

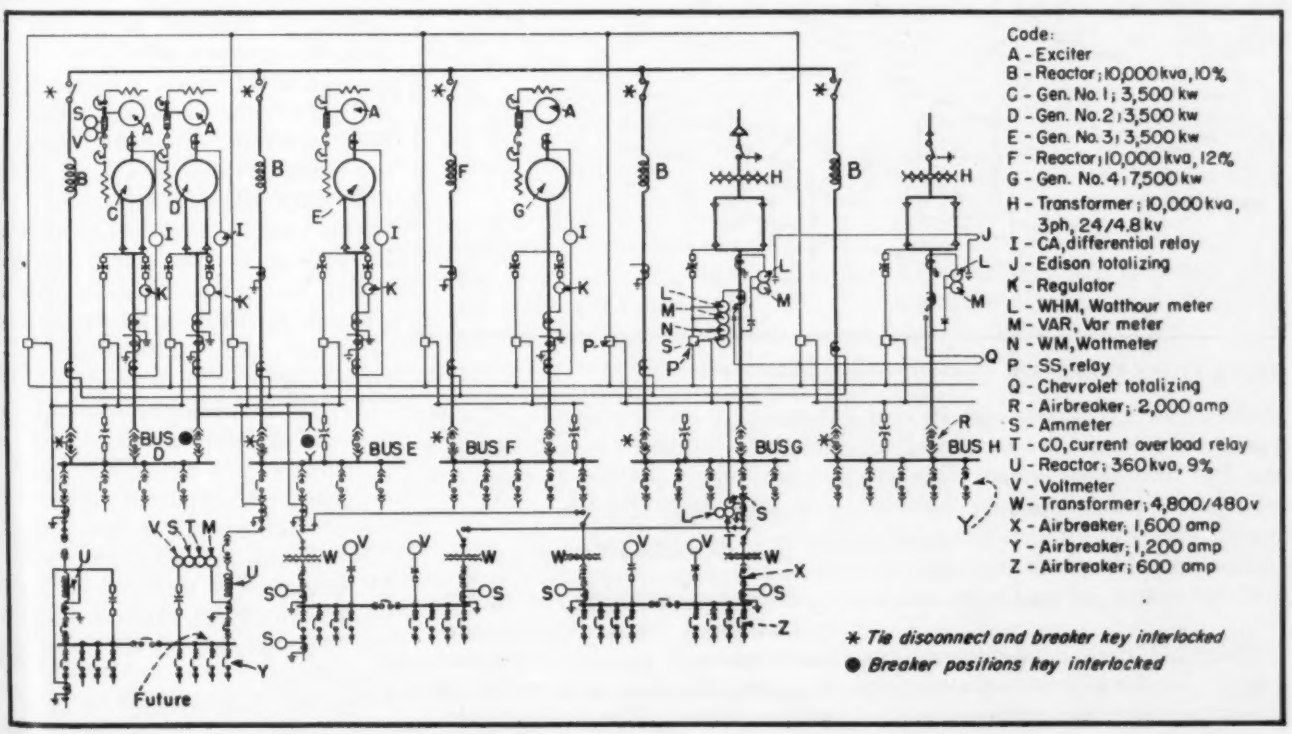


PART OF THE INTERIOR of the duplex control cubicle. The walk-in cubicle has entrance doors at either end

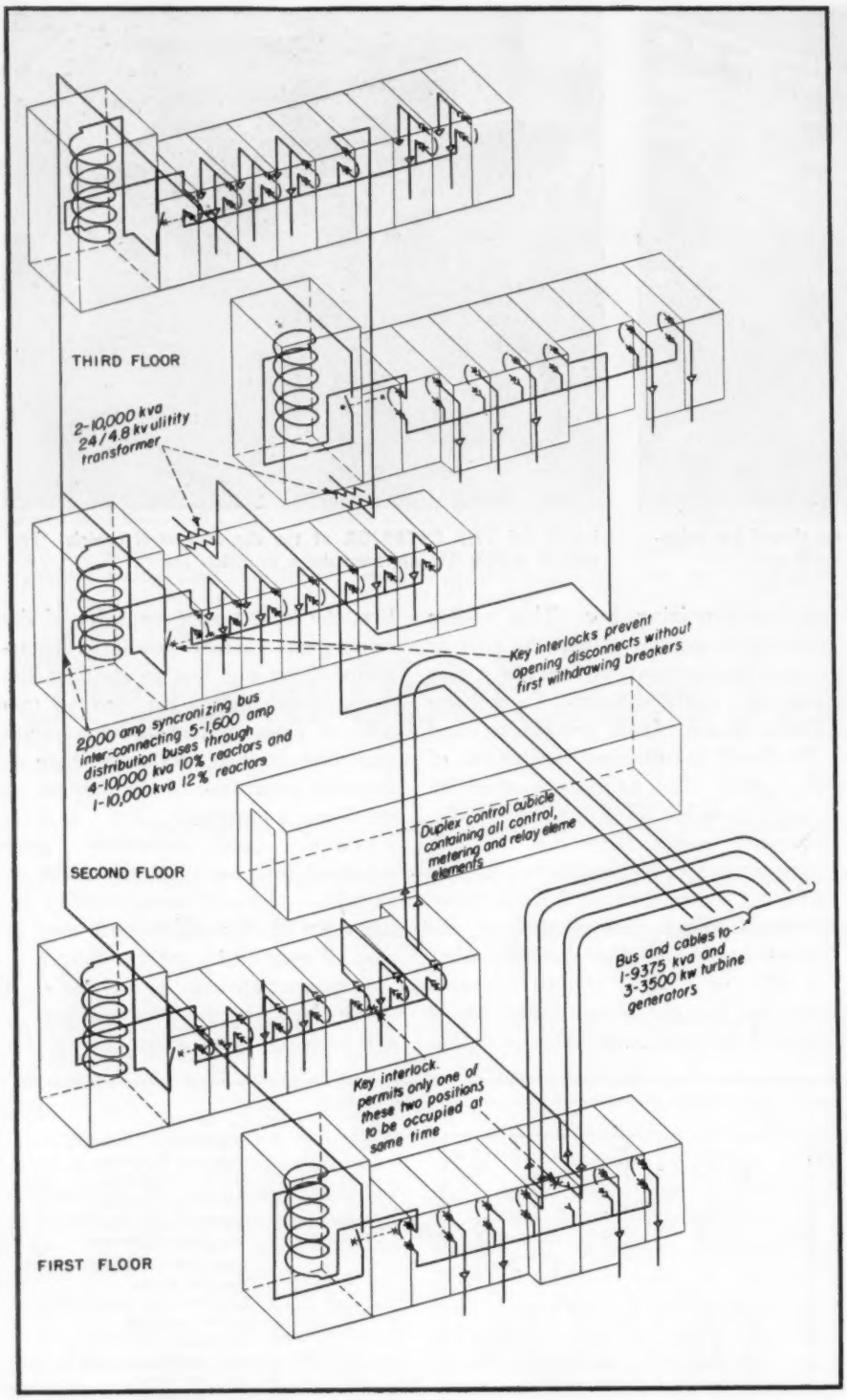
sioned to prepare the designs. The Harlan Electric Company of Detroit carried out the installation.

To secure maximum flexibility and dependability it was decided at the outset to install a system of which the Detroit Edison Company would approve and permit to synchronize with their system. Several standard types of bus schemes were considered. The first thought, of course, centered around the simplest, a single bus. Rupturing capacity in the order of 500,000 kva brought the abandonment of that idea in favor of several buses tied together by a reactor tie or synchronizing bus. This system was more attractive than the ring or star bus arrangement because it was simpler, could maintain its voltage better under fault conditions and fitted well the physical limitations of the plant. The primary system installed consists of five separate distribution buses, three fed by four generators and two fed by two 10,000 kva, 24/4.8 kv Detroit Edison transformers. Each bus is tied to the synchronizing tie bus through either a 10% or a 12% reactor. In this way the maximum available fault is limited to a capacity below 250,000 kva, the interrupting capacity of the switchgear. When power is transferred from one bus to another, the current path is always through two sets of reactors and the maximum variation in bus section voltage is constant regardless of the number of sections comprising the system. Flexibility and reliability were achieved by providing two feeds to each load bus and enough utility capacity to feed nearly the full load in case of generating system failure.

Combination of a single dual steam-electric exciter and single voltage regulator were abandoned and a


Code:
A - Exciter
B - Reactor; 10,000 kva, 10%
C - Gen. No. 1; 3,500 kw
D - Gen. No. 2; 3,500 kw
E - Gen. No. 3; 3,500 kw
F - Reactor; 10,000 kva, 12%
G - Gen. No. 4; 7,500 kw
H - Transformer; 10,000 kva, 3ph, 24/4.8 kv
I - CA, differential relay
J - Edison totalizing
K - Regulator
L - WHM, Watthour meter
M - VAR, Var meter
N - WM, Wattmeter
P - SS, relay
Q - Chevrolet totalizing
R - Airbreaker; 2,000 amp
S - Ammeter
T - CO, current overload relay
U - Reactor; 360 kva, 9%
V - Voltmeter
W - Transformer; 4,800/480 v
X - Airbreaker; 1,600 amp
Y - Airbreaker; 1,200 amp
Z - Airbreaker; 600 amp
BUS D
BUS E
BUS F
BUS G
BUS H
Future
* Tie disconnect and breaker key interlocked
● Breaker positions key interlocked

GENERATOR and bus protection and metering scheme for dual service


THIRD FLOOR
2-10,000 kva 24/4.8 kv ulitity transformer
Key interlocks prevent opening disconnects without first withdrawing breakers
2,000 amp syncronizing bus inter-connecting 5-1,600 amp distribution buses through 4-10,000 kva 10% reactors and 1-10,000 kva 12% reactors
Duplex control cubicle containing all control, metering and relay eleme elements
SECOND FLOOR
Bus and cables to 1-9375 kva and 3-3500 kw turbine generators
Key interlock permits only one of these two positions to be occupied at same time
FIRST FLOOR

THREE-STORY ISOMETRIC PLAN of primary feeder system

direct connected exciter with its own voltage regulator was connected to the shaft of each generator. This set-up makes it possible to vary the voltage of each bus section, control the purchased power phase angle and adjust the system for maximum stability.

Metalclad, electrically operated air circuit breakers were selected for maximum safety and minimum maintenance. The control voltage is maintained by a motor-generator set with automatic throwover to a battery. The battery is kept charged by a diverter pole motor-generator set.

Centralized Control

All control, metering and relaying is centralized on a duplex control board making it possible for one man to operate the turbines as well as the control board. The control board consists of a walk-in cubicle with access doors at each end. Control devices, mimic bus and indicating meters are located on the front of the board. Regulators, relays, recording meters and integrating meters are located on the back. All devices, terminal boards and wiring are accessible inside the cubicle for ease of inspection and maintenance.

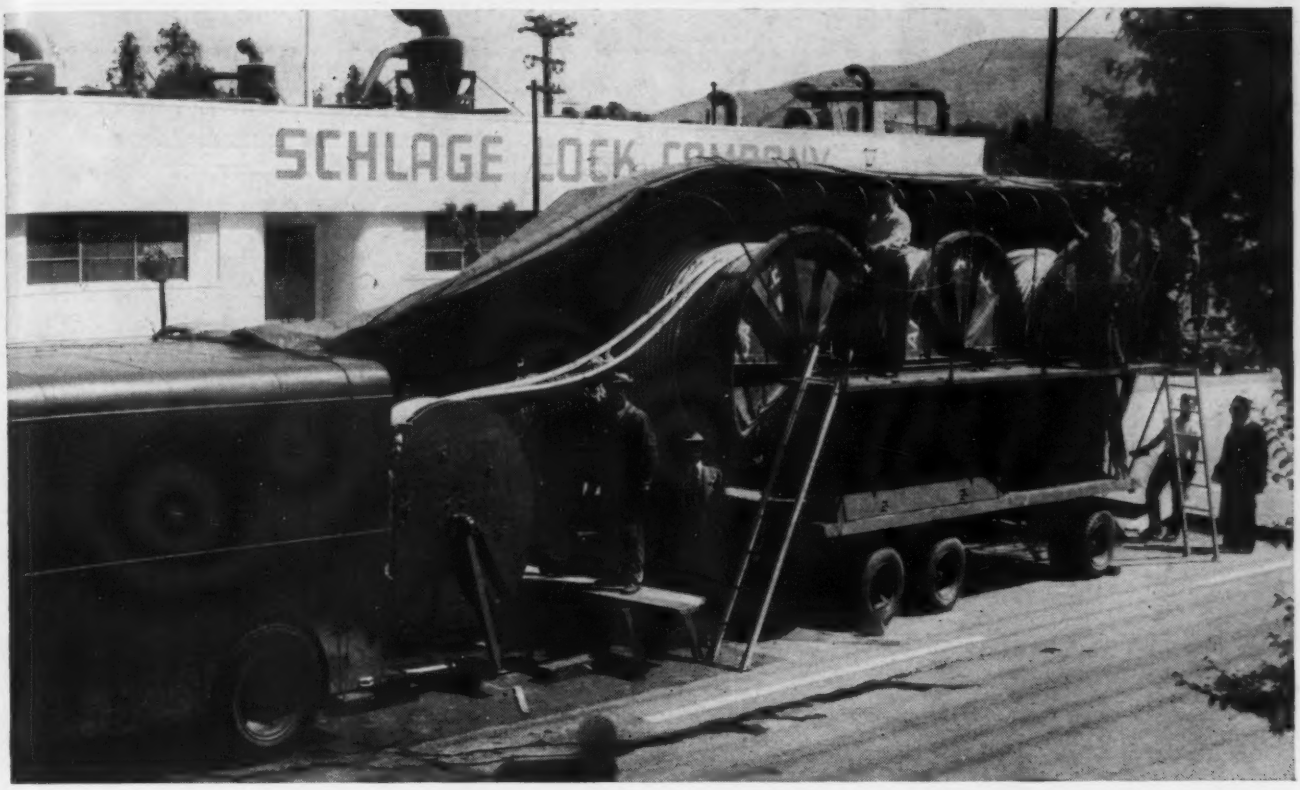
Because of space restrictions it was necessary to install the system in a four story switch-house at one end of the turbine room. Two generator buses are on the first floor, one generator bus and the control board on the second floor, two Edison buses on the third floor and the control battery, electrostatic air cleaner and air conditioning equipment are located on the fourth floor. Each bus section consists of steel cubicles housing the distribution breakers, generator and transformer breakers, the reactor tie breaker and, at the end of the lineup, the reactor. With relays, control and metering equipment located on the control board, only three pilot lights are located on the fronts of the breaker cubicles. A green pilot light indicates that the breaker is ready for operation; red indicates that the breaker is closed and white that the breaker has tripped out.

Tie Bus Protection

The synchronizing tie bus is protected by CO relays in the reactor tie lines. Type CA6 differential relays operate to trip out all reactor tie breakers on synchronizing bus faults through a WL relay. A horn, a bell and pilot lights warn the operator of this condition. Faulted generators are removed from the system by CA differential relays. Each transformer is protected by a CO overload relay as well as by Type CR directional overcurrent relays which operate to trip out the breakers on transformer or primary cable faults. Distribution circuits are cleared from the bus by CO relays with instantaneous trips on overload or fault current. A bell and pilot lights warn the operator of this condition. A Type CW directional power relay in each transformer circuit operates in conjunction with a TK timing relay to sound an alarm when more than 250 kw is fed back to the Edison system for more than one half minute.

Transformer, generator and reac-

(*Continued on p* 127)



CABLE REEL TRAILER designed and built by Pacific Gas and Electric Co for installation of first high voltage, high-pressure gas-filled pipe type cable in the West. With careful planning, it has made possible two complete cable pulls per day up to 1,800 ft.

New Trailer, Tension Indicator, Speed Western Cable Job

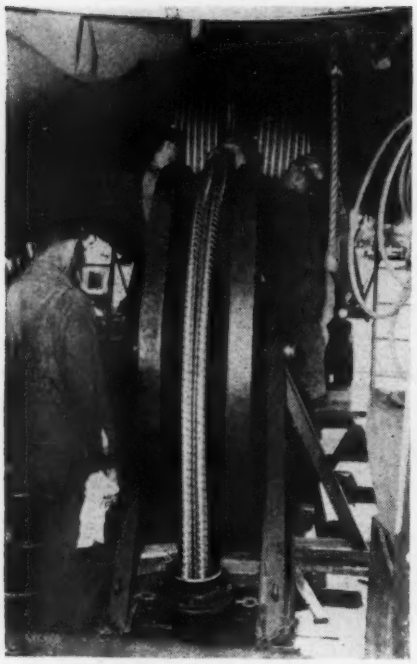
F. B. SCHULLERTS
Pacific Gas and Electric Co.
San Francisco, Calif.

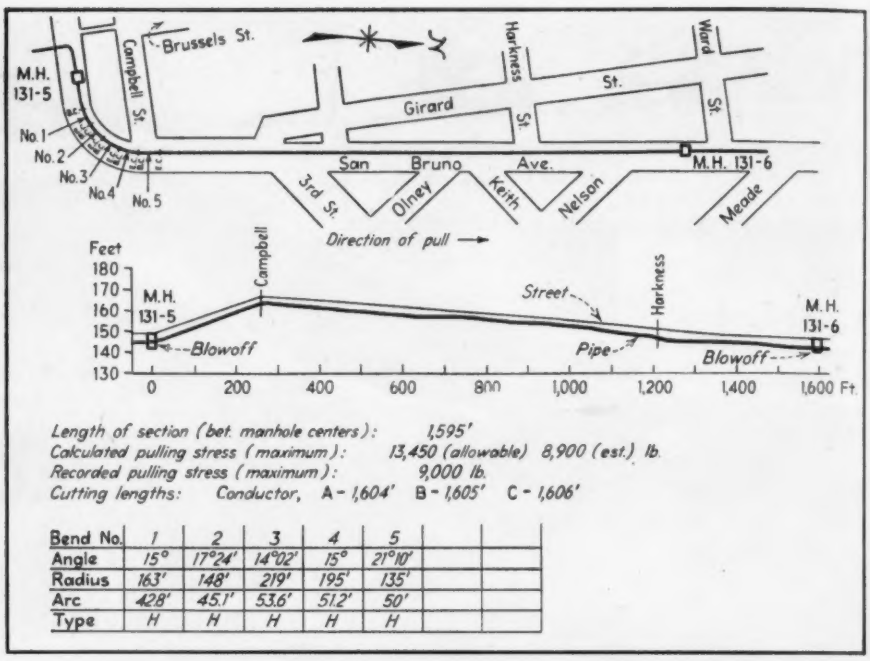
TWO CABLE PULLS up to 1,800 ft each per day have been made possible through use of a special cable reel trailer and a continuous tension indicating device in the West's first installation of high pressure gas-filled pipe-type cable. This is being accomplished in the installation of 18 circuit miles of 110,000-volt, 1,000,000-cir mil segmental type cable now under way in San Francisco by Pacific Gas and Electric Co.

The cable reel trailer, designed and built by P. G. and E. is mounted on small diameter dual wheels, as shown. Cable from the three tandem-mounted reels is pulled over a large "V" grooved guide wheel that keeps the three cables in equilaterial configuration as they enter the feed-in tube. Cable from the rear reels passes over and rests on the reel ahead. Men are stationed on the catwalks supporting the reel shafts to inspect and guide the cable as it is unreeled.

Close observation of the pulling operation is maintained by men stationed at the tension indicator. This device, also of P. G. and E. design, consists of a sheave on a floating shaft, supported in a slot on each side of an "A" frame by a hydraulic piston. These two pistons are mounted along the supporting channel, which is at an angle of 45 degrees from the vertical. Pressure gages on the hydraulic cylinders respond to the resultant of the forces in the pulling cable and are calibrated to read directly pounds tension on the cable. A calibration chart gives correction factors for angles of the pulling cable over the sheave other than 90 degrees. Up to about 10 degrees variation the correction is less than 3 percent. Revolutions of the sheave are counted mechanically to indicate footage pulled at any time. Observers read tension at 40-ft intervals, as determined by this counter.

Supervisor on the job is given a data sheet showing length, profile, plan, maximum allowable tension, and estimated maximum pulling tension for each pull. This in combination with the continuous indication of actual pulling tension gives him close supervision over the job at all times. A very important part of the set-up is two-way FM radio communication between the feed-in and pull-



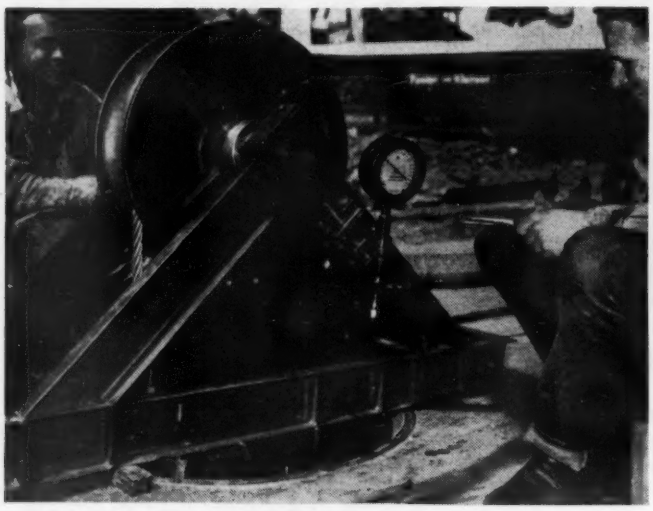


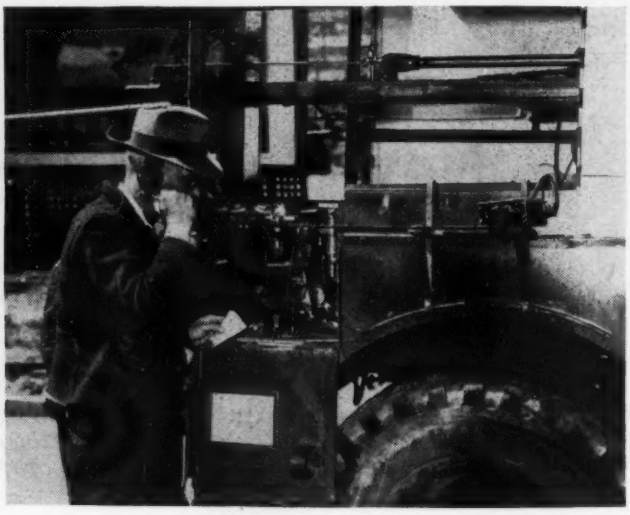
Length of section (bet. manhole centers): 1,595'
Calculated pulling stress (maximum): 13,450 (allowable) 8,900 (est.) lb.
Recorded pulling stress (maximum): 9,000 lb.
Cutting lengths: Conductor, A - 1,604' B - 1,605' C - 1,606'

Bend No.	1	2	3	4	5		
Angle	15°	17°24'	14°02'	15°	21°10'		
Radius	163'	148'	219'	195'	135'		
Arc	42.8'	45.1'	53.6'	51.2'	50'		
Type	H	H	H	H	H		

CABLE FEED-IN ARRANGEMENT is directly from shipping reels, mounted in tandem on trailer. Cables pass over a guide reel, are oriented and enter feed-in tube

TYPICAL DATA SHEET prepared for each section gives supervisor necessary information such as length of pull and maximum allowable tension for each pull. The sketches show complete details of the job to be done. A table specifies essential data such as the angle, radius, arc, and type for each individual bend





CABLE TENSION MEASURING DEVICE (left) developed by P. G and E. engineers to give continuous indication of pulling tension while cable is in motion. Resultant of pulling force is transmitted through the floating sheave shaft to a hydraulic piston on each side. Pressure gages on the hydraulic cylinders respond to this force and are calibrated to read pulling cable tension directly in pounds . . . Remote controls (right) were provided on winch truck so that operator with telephone and in full view of operation could respond to pulling signals immediately This method of direct supervision and control simplified the cable installation.

out manholes. If abnormal tension should develop the pull can be stopped in a matter of seconds.

Two of the 110-kv circuits will connect a new 200,000-kw steam plant and the terminus of incoming transmission lines supplying San Francisco. An additional circuit from each of these points will serve a new four million dollar distribution substation being built in the downtown area of the city.

While perfecting the initial model of his sounding electro-magnetic telegraph in 1828, Joseph Henry noted the drop in current pressure produced by the mile long wire in his circuit. He reasoned that a secondary power source should be supplied at the point of operation to avoid the line loss and attendant loss in work availability. He decided to control the operation of a switch on this secondary power source and thereby controlled the final operation. He designed a magnetic switch for this purpose and so perhaps was the first to use what has come to be known as a "relay."

WHEN MEETING INCREASED LOADS, costs are effected by whether more transformers are added or larger units are substituted

Determining Least Cost By Kelvin's Law

When making minimum cost calculations for meeting expanding loads: (1) Include both base costs and incremental costs when adding more units of same size and; (2) use only incremental costs when merely replacing existing units with larger units

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CHASE HUTCHINSON
Electrical Engineers,
Ebasco Services Incorporated

WHEN LORD KELVIN gave the technical world his famous law relating to economic balance between two costs one of which is directly and the other inversely proportional to a given variable, he rendered a signal engineering service. This discussion calls attention to a very common source of error in such minimum cost determinations such as, economical loading of distribution transformers and economical size of conductors in transmission and distribution lines. Briefly, for equipment and circuits such as feeders, when adding more units of the same size use base costs plus incremental costs; but when merely substituting larger units use only incremental costs. For clarity, the graphical method of solution is used for illustration. An alternative, and generally more rapid, method of solution is Lord Kelvin's mathematics.

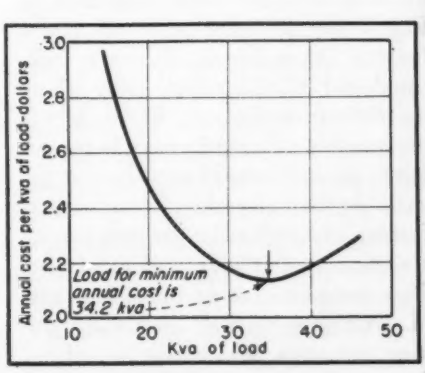

FIG 1—ANNUAL per kva fixed costs and loss costs for 15 kva transformer

For the first illustration, consider economical distribution transformer loading. To show the matter clearly and simply, only costs and losses of the transformers themselves are used. This simplification omits or changes several factors often included in an analysis—(1) Omission of cost of material and energy losses of secondary, and frequently primary, conductors; (2) use of "instantaneous" annual costs of energy losses instead of "cumulative" costs collected over a period of years for a growing-load

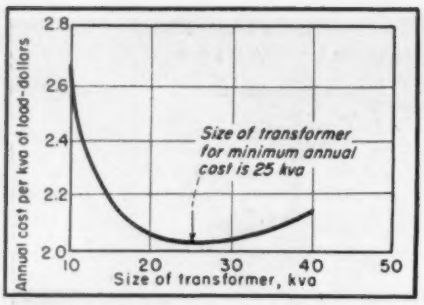

FIG 2—ANNUAL per kva fixed charges plus annual loss costs based on 34.2 kva of load from Fig. 1

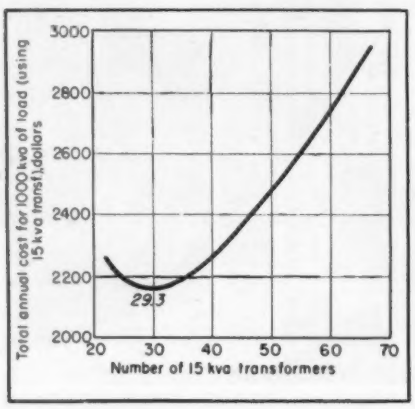

FIG 3—NUMBER of 15 kva transformers to serve 1,000 kva of load

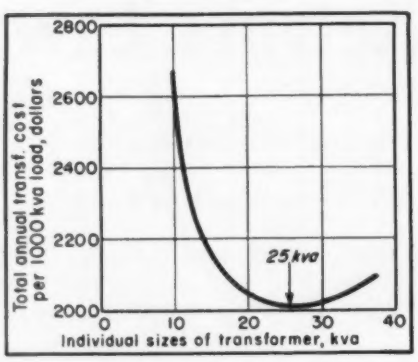

FIG 4—TOTAL annual costs of different sizes of transfoormers loaded to 34.2 kva each to serve 1000 kva of load

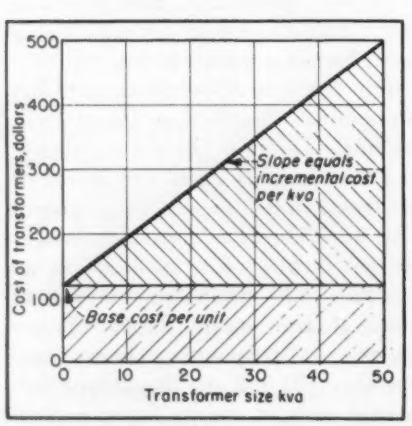

FIG 5—COST of transformers, showing relation of base and incremental costs

area (a common simplification); and (3) omission of the effect of transformer loading on transformer life.

A common graphical method of exploring transformer costs as affected by loading is shown in Fig 1. This and the following graphs involve relations to which Kelvin's law is applicable. The costs shown in Table I are held constant throughout this discussion. The investment values include cost of installation and cost of accessories such as lightning arresters, cutouts, and hangers. For a 15 kva transformer, Fig 1 indicates the most economical loading is 34.2 kva or 228% of nameplate rating.

Using the basic cost data of Fig 1 in a different manner results in Fig 2. This apparently is in disagreement with Fig 1 for Fig 2 shows the economical size of transformer to serve the 34.2 kva load to be 25 kva with 137% loading. This is contrasted with a most economical load of 34.2 kva or 228% of 15 kva transformer rating as shown in Fig 1. What is wrong here? Nothing! Both figures are correct.

Perhaps the apparent disagreement can be explained best by taking a fixed load of sizeable magnitude and exploring costs with a large number of transformers instead of using single units. A fixed load of 1,000 kva and a fixed transformer size of 15 kva is assumed in Fig 3. Total annual costs are plotted for different numbers of 15 kva transformers. It will be noted in Fig 3 the economical number of transformers is 29.3 transformers. This number divided into the 1,000 kva of load gives 34.2 kva per transformer, the same value indicated by Fig 1.

Similarly Fig 4 shows the total annual costs for 1,000 kva of load, but with the number of transformers fixed at 29.3, the value indicated by Fig 3 for different sizes of transformer. As in Fig 2, 25 kva is indicated and it is becoming clear where the difference lies. In Fig 3, where the number of transformers is varied, it can be understood readily that the variable includes the "base" transformer cost,—that is, the cost per installation that is independent of size. This includes cost of installing, cost of auxiliaries such as fuses and lightning arresters, and a portion of the factory cost of the transformer,—that portion that is involved more or less in getting a unit of any size (even zero capacity) through the factory. Every time a transformer installation is added or subtracted, the cost of one whole installation including a block of this base cost is added or subtracted. In Fig 4, although included in the dollar figures, this base cost is not involved at all in the economics because the number of installations is fixed. The cost that is involved is the "incremental" cost. For practical purposes this cost is proportional to the size of transformer.

Two Cost Factors Involved

The relation of these two costs is shown in Fig. 5, which gives the approximate cost of different sizes of distribution transformers installed, including auxiliaries. Base portions of loss costs are properly a part of total base costs and their capitalized values are included. Fig 1 and 3 apply when load growth is handled by adding new transformers of the same size at intermediate locations, which take some load from the old transformers. In other words, both old and new transformers are the same size but since there are more of them they can supply the greater load. (Remember that this is not a complete picture; secondary and primary conductor costs are not included and the costs shown are "instantaneous" values.) Fig 2 and 4 apply when load growth is handled by replacing excessively over-loaded transformers with units of larger size at the same locations. Although the number of transformers remains the same, the new transformers of greater capacity carry the increased load.

In general purpose distribution systems, neither one of these two types of operating practices is in effect to the exclusion of the other. The proper loading, insofar as the "instantane-

TABLE I—Basic Data Used in Computing Curves

Cost of Losses	
Kilowatt of demand, annual	$22
Kilowatt hour of energy, each	$ 0.004
Load factor, annual	35%
Corresponding loss factor, annual	18%
Fixed Charges, annual	12.65%
Incremental Cost of Copper Installed, per lb	$ 0.50
Cos t of Transformers Installed	Approx. as in Fig 5
Line Conductor Temperature, approx	43 C
4 Kv Feeder Position (Substation equipment and getaway cable), each	$12,530
Feeder Poles, per mile	$ 2,000

ous" transformer costs alone are indicative, undoubtedly lies between the two indicated values.

Typical Graphical Analysis

A type of graph frequently used for exploring transformer costs and conductor costs is shown in Fig 6. This is the same as Fig 1 except that curves for several different sizes of transformers are plotted.

The envelope *C* is commonly assumed to be properly indicative of economical loading. But look at the point *B* which is the minimum cost point for our load of 34.2 kva studied in the foregoing discussion. It is seen that this is the same size of transformer as indicated in Fig 2 and 4. Thus, the bottom lobes of these curves correspond to the indications of graphs similar to Fig 2 and 4, which are only truly indicative under specific well defined (but not solely practiced) conditions.

In using the curves to select the transformer *size* that gives lowest annual cost, the user discards (often unwittingly) base costs as a factor in his determining the economics, even though these costs are included in the dollar values that make up the curves. To include the full effect of base cost as a factor, use curve *A* drawn through the minima of the various cost curves.

As shown by the curves in Fig 6, cost differences are small even though the differences of percentage loading values are large. This flatness of the curves undoubtedly is one reason why utilities have not "gone broke" in the past from mistaken economics. Another is that common sense often comes to the rescue. But, the matter is basic, and it is not safe to discard it as negligible.

Sometimes, large errors may be involved. For example, consider a 3 phase 4/0 4 kv feeder ½ mile long. A graph similar to Fig 1, is shown for it in Fig 7. The assumed installed cost includes a pole line, pole-head accessories, a station circuit breaker, and feeder position at a substation. Note the indicated economic loading is 395 amperes for the 4/0 conductor. This graph applies when load growth is handled by installing additional feeders of the same size.

A corresponding graph is shown in Fig 8, plotted similarly to Fig 2. Here only the incremental cost (not the feeder base cost) of the feeder copper size is involved and the resulting economic loading is entirely different. This is applicable where a feeder is installed to feed a specific fixed spot load that will remain the same for a long period. This is a limiting condition seldom encountered, but this type of approach is very commonly used for determining copper size for any applications.

In conclusion: (1) Choose carefully the method of applying graphic solutions or Kelvin's law to problems involving minimum cost determinations. (2) When size of units is held fixed and load growth is handled by adding units, use the approach that includes both base costs and incremental costs as shown by Fig 1, 3 and 7, and curve *A* of Fig 6. (3) When number of units is held fixed and load growth is handled by changing size, use the approach that includes only incremental costs as shown by Fig 2, 4 and 8 and curve *C* of Fig 6. This approach also applies to problems of choosing size of units to serve spot loads that will remain fixed in amount. (4) When both methods of handling load growth are in effect, use some combination of the two approaches.

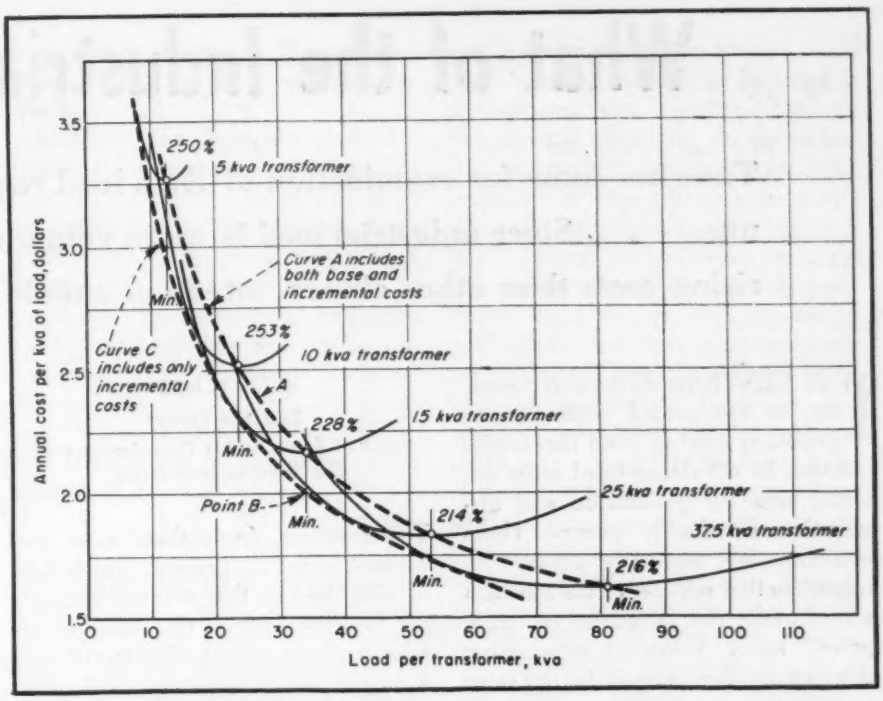

FIG 6—ANNUAL COST per kva of load for 7,620 volt transformers. Envelope A includes both base and incremental costs; envelope C includes only incremental costs

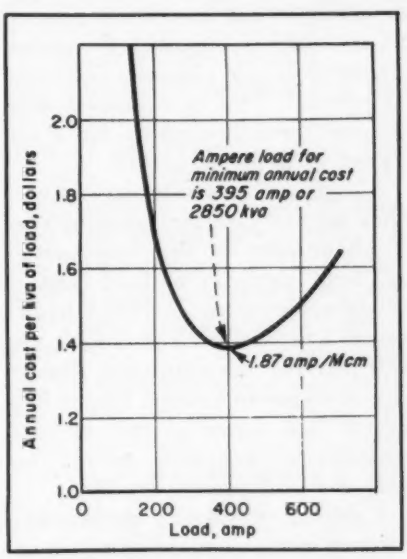

FIG 7—ANNUAL FIXED CHARGES and losses for half mile 4/0 feeder and feeder position are minimum at 395 amp

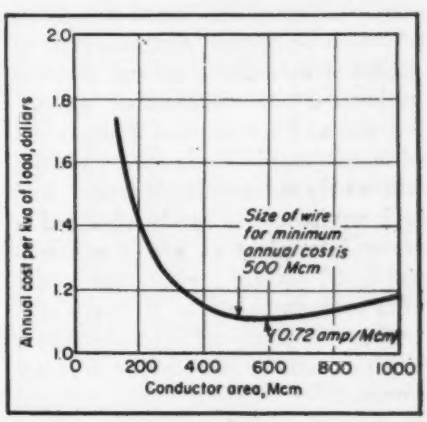

FIG 8—ANNUAL per kva fixed charges plus annual loss costs based on 2,850 kva of load from Fig 7

What of the Industrial Load?

Time has come for examination of class load requirements and revenues . . . Since industrial load is more vulnerable to the impact of rising costs than other classes, attention should be given to it first

H. J. FLAGG
Executive Officer
Board of Public Utility Commissioners of The State of New Jersey*

THE CENTRAL STATION industry is confronted with serious problems flowing from the drastic changes in all elements of costs entering into the production and distribution of electric energy. These problems are especially acute with respect to that portion of the business served under the 'industrial' or 'large power' rates. Delay in recognizing this fact and hesitancy in taking steps to meet the new conditions may lead to unhappy consequences.

For some time now the electricity supply industry has found it difficult to obtain equipment and materials to enable it to make a decent showing in the race with continuously increasing demand for service. Restoration of a reasonable margin of capacity still is only an executive's dream. And such equipment as can be obtained is going into plant at a cost approximately 60 percent greater than would have been the case 8 to 10 years ago.

There is plenty of evidence that a buyer's market is developing in many commodities. This is bound to have an impact on the manufacturers of those commodities and that impact will assuredly go right through the producer's factory over utilities' lines and into their cash registers.

Ratio to the Whole

Of first consideration are those features of the industrial load that may be in line for some drastic, if not revolutionary, changes.

How much is known about the relationship of this industrial load to the central station business as a whole? Well, to start with, and comparing 1947 with 1940, it is known that the kilowatt-hours sold in the 'large power and light' classification increased 88 percent while total sales to all classes increased 82 percent. The revenues from these sales increased about 72 percent, which ties in with the fact that average revenue per kilowatt-hour in this category of sales declined from 1.061¢ to 0.968¢, a drop of about 9 percent. Still comparing 1947 with 1940, we find that the increase in the number of customers in the 'large power and light' classification was less than 5 percent. So, as would be expected, the annual consumption *per customer* increased 80 percent. This is consistent with the practice of 'around the clock' operation of factories.

A curious consistency appears when we compare the ratios of kilowatt-hour sales in the 'large power and light' category to total sales to ultimate consumers. In 1940 the ratio was 50.3 percent while in 1947 it was 52.0 percent. No significant change. The corresponding ratios for the four largest New Jersey electric utilities, consolidated, are 49.8 percent for 1940 and 53.8 percent for 1947.

A similar consistency appears at a different level, when we compare operating revenues in terms of ratios. In 1940, the revenue from 'large power and light' sales was 25.8 percent of total sales of energy; in 1947 it was 28.6 percent. The corresponding ratios for New Jersey are: For 1940, 21.1 percent; for 1947, 31.4 percent. It is probable that the New Jersey ratio for 1947 is higher in relation to the national ratio because of the effect of fuel adjustment clauses which are applicable to large power and light usage but have not so generally been applied to the usage of smaller customers. The recovery of increased fuel costs by this device may have been greater in New Jersey than in the country as a whole.

These figures lead to the conclusion that because of rate classifications geared to nature of energy use, about one-half of the total kilowatt-hour sales produces about one-quarter of the total operating revenue. But the really significant question is what proportion of the *operating income* does this part of the total business contribute? One may venture a guess that scarcely a dozen electric utilities in the United States have any but the vaguest notion of the relative costs—or productivity in terms of net earnings—of the several classifications of their business. Many utilities really do not know whether their industrial load under present rates is a desirable class of business or not.

Need for Load Research

What is the reason for this industry-wide ignorance of economic facts? Probably there exists a general apathy to the subject in high places. More likely it may stem from the dearth of studies to establish the basic load characteristics and other statistics essential to a solution of this 'joint cost' problem. Such studies require considerable time and they must be made periodically so that they will reasonably reflect the changes that are bound to occur with load development. The apathy will disappear and the needed studies will be made when the regulatory commissions fully appreciate the importance of the job to be done and set up a committee to work in cooperation with an industry committee to establish a procedure to accomplish it. This was what happened in the case of the telephone industry when the problem of separating plant investment, revenues, and operating expenses between exchange, intrastate toll and interstate toll business had to be dealt with.

If careful studies show that the industrial load is presently undesirable

* The views expressed here are not to be taken as necessarily reflecting the views of the New Jersey Commission.

because of poor net earnings characteristics, then appropriate steps should be taken to make it contribute its proper share of the utility operating income.

If in the recent past there has been some margin for return in the revenues from industrial load, it is very likely due at least in part to the relatively favorable load factor that has characterized this class of business. If the load factor diminishes—as it surely will if industry returns generally to a one shift basis—the utility industry can well be seriously concerned with the question of whether such return will continue. This concern lies not alone with the utility industry. The regulatory commissions should be equally concerned. And why? Because it is plain that if rates for all classes of service have produced no more than a reasonable return in the past there can be little or no margin to absorb the increases in operating expenses and fixed charges that every utility is experiencing today. So every unfavorable change in the business only hastens the day when the utilities must come to their commissions seeking increases in rates.

Aside from the controlling question of adequacy of overall return a chief point of concern from the regulatory standpoint is whether a compilation of rate schedules—or a rate tariff—permits or imposes undue discrimination between classes of customers.

Convenient, but Improper

A utility claims that it must have increased revenue and proposes to get it by revising such and such a rate schedule in a certain way and another rate schedule in possibly a different way and so on. More likely the utility might propose the convenient but improper course that of a uniform surcharge per kilowatt-hour across the board on all or most of the rate schedules and all or most of the consumption blocks in those schedules. That method is generally acceptable for applying a fuel adjustment charge, but basic costs of the utility business do not move in any such simple relationship, and in these days basic costs are shifting drastically. Rates that blindly adhere to traditional standards or patterns or those tailored to fit a temporary expedient or managerial preference can easily create situations that will be very painful to deal with in the future.

A utility may claim and prove by means of bill analysis data that the rates it proposes to charge will yield the needed additional revenue. That is very well so far as it goes, but if the utility is asked if it may not be proposing to sell industrial energy at a loss that must be made up by excessive charges to one or more of the other classes of customers, a variety of answers may be forthcoming. One answer that is not likely to be heard is this:

Mirabile Dictu!

"We have analyzed our costs of doing business; we have determined our class costs to serve; we have decided on the reasonable share of our required return that each class of customers should provide; and these rate schedules are designed to produce that return without undue discrimination either between customers in a class or between classes."

No inference is intended that the rate of return from each class of customers should be the same. On the contrary, if the overall fair rate of return should be 6 percent then it could be perfectly proper and not unduly discriminatory to charge the industrial customers rates that might produce less than 6 percent rate of return on the part of the rate base allocated to that class of customers while at the same time charging the commercial lighting customers rates that might produce more than 6 percent rate of return on their allocated part of the rate base. These relationships are governed by economic considerations, ranging from 'what the traffic will bear' in one case to 'what the service is worth' in the other.

Even though in some cases it can be shown that under rates that the traffic will bear the industrial business contributes something to return, it may be found under present conditions of restricted capacity and relatively higher unit cost of increased capacity, that sales effort should be directed toward other classes of business because of the better profit potential therein.

A point to bear in mind is that—aside from terms and conditions of service—the only legitimate control a utility has over the business that may become attached to its lines is an economic one, exercised through the medium of prices. In the industrial power category, if rates are compensatory to the utility and enable the customers to take service at a lower overall cost to them than any alternative means of meeting their power requirements, then the utility will hold its customers, gain new ones, make money, and there would probably be no question about the propriety of providing more capacity to serve such a load. On the other hand if industrial power rates are not compensatory to the utility but are advantageous to the customer and the overall return is adequate, then it follows that some other classes of use are making up the loss on the industrial business. Whatever the facts may be they should be ascertained and made available as guides to managerial and regulatory judgment.

The fuel adjustment clause has been mentioned as a device to recover from the customers at least a part of an increase in the cost of fuels. Perhaps in no service classification is such a clause more important or appropriate than in industrial power. If power rates were properly designed in the first instance the energy component of the rate was closely geared to the unit cost of production at the time the rate was fixed. The predominant element in production cost is the price of fuel. Let fuel costs go up and—unless there is a fuel price adjustment clause in the rate schedule—the utility may quickly find itself selling electrical energy at less than production cost.

How About Competition

There are other elements in the industrial power load problem that will have to be faced. For example, what will be the impact of improved 'packaged power' units, using diesel engine or gas turbine prime movers? One thing is sure; the central station companies will have competition from this source once the manufacturers are in position to go after the business. But the same economic laws apply to the customer who installs a private plant as apply to the central station. The danger lies in the possible failure of one or the other to

(*Continued on page* 127)

Increased Facilities Geared To Analysis Of Load Trend

System load based on long-range forecasts—Residential customers to average 140 kwhr in December 1956—Industrial sales to increase about 6% per year—Commercial sales influenced by same factors as for residential sales.*

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TO ASSIST the management of this company in reaching conclusions concerning future load growth, the first Load Development Committee was organized in January 1923. This committee now consists of two members each from the Electric Generation Department, the Sales Department, and from the Electric Distribution Department. It reports to the General Manager, Electric Department. In addition to preparing special reports as may be necessary, it publishes regular forecasts twice each year. Following December peak load periods, the committee prepares a 10-year forecast of the maximum kilowatt load on the system, a 5-year forecast of the kilowatthour sales to residential, small commercial, and large industrial consumers, and the total kilowatthour output requirements, and a 3-year estimate of maximum substation loads. In the fall, monthly estimates of killowatthour sales and output are made for 16 months, and the spring forecasts are reviewed and. if necessary, revised.

Long-Range Forecasts

Load and kilowatthour forecasts are approached from two points of view—the long-range and the near-term. Ten-year estimates of loads and killowatthour sales and outputs, assuming normal business conditions, are made by projecting into the future the upward-sweeping curves of normal growth—the secular trends which persist despite recurrent business booms and depressions. Making near-term estimates is more difficult.

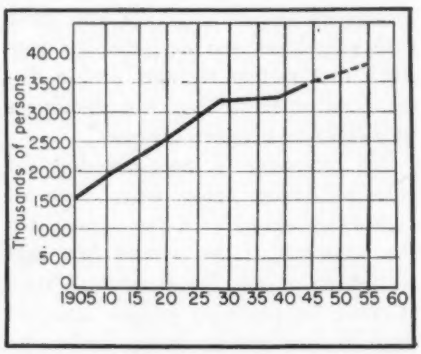


FIG 1—POPULATION of municipalities receiving PSE&G Co electric service

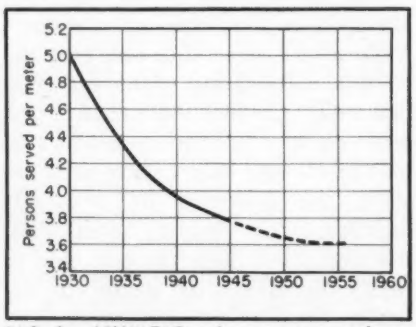


FIG 2—NUMBER of persons served per residential meter

In contrast to long-range estimates, they are greatly influenced by the expected level of business activity so that careful evaluation of current and prospective business conditions is necessitated.

In general, estimates of system maximum kilowatts are derived from forecasts of system kilowatthour output requirements. Output is forecast by summation of individual estimates of residential, commercial, industrial, and street lighting sales and the associated losses.

Residential Customers

Kilowatthour sales to residential customers vary directly with the population of Public Service territory. Fig 1 shows the population of the territory receiving electric service. Estimates predict a rise of 17%, or 550,000 persons added, from 1940 to 1956. Fig 2 reveals that it is estimated that by 1956 each 3.6 persons in our territory will represent a customer on our lines, which will result in the addition of 234,000 customers to be supplied with electric service and metering.

The extent to which each customer uses his electric facilities is another factor to be considered in estimating residential sales. In 1930, the average residential customer used 44 kwhr in December; by 1940 he was consuming 72 kwhr, and in December 1946, his use was 100 kwhr. It is estimated that the average residential use per customer will increase to 140 kwhr in December 1956.

Commercial kilowatthour sales are influenced largely by the same factors which affect residential sales. With a growing population, additional stores, churches, office buildings, hospitals, theatres, and restaurants are required to satisfy community needs. It has been found practicable to estimate commercial sales directly from an extension of the long-term growth trend.

Large industrial customers consume from 55 to 60% of the total kilowatthour sales to all customers and 90% of industrial sales are used by

* Adapted from a paper presented at recent Edison Electric Institute, Electrical Equipment Committee meeting in Cincinnati, Ohio.

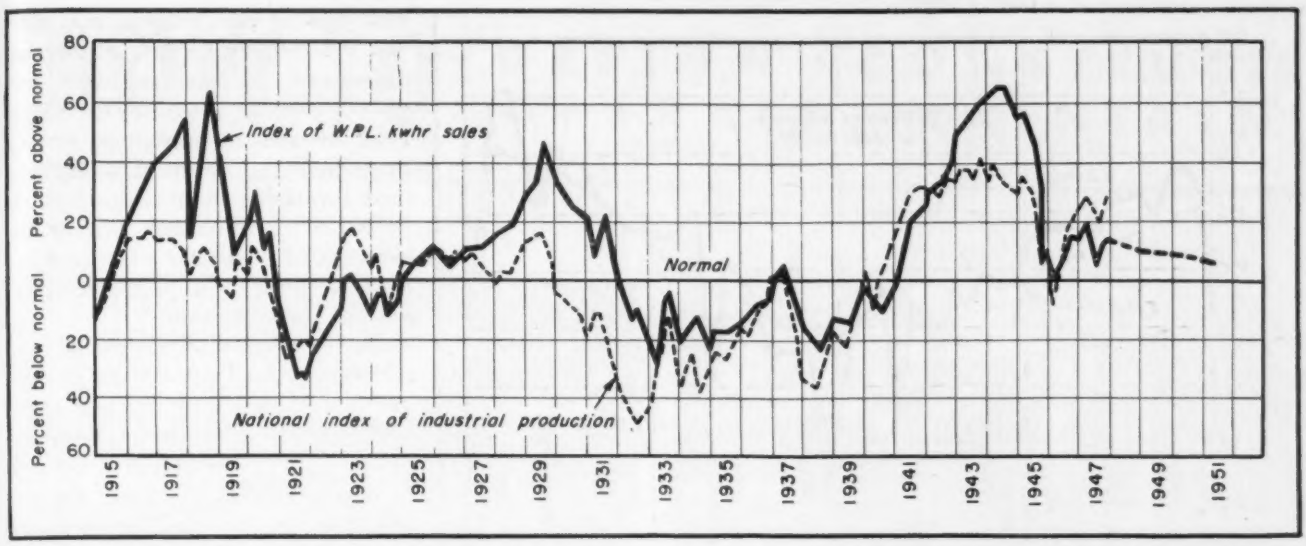


FIG 3—INDEX of the company's wholesale power kilowatthour sales. Note: The index is the ratio of actual wholesale power and light (WPL) sales corrected for seasonal and calendar adjustments divided by the long-term trend. Areas above and below the normal line (extended horizontally from zero on scale) are approximately in balance for the period 1905-1940 inclusive.

customers in the WPL (Wholesale Power and Lighting) classification. Long-range estimates of sales are made by projection of long-term trends of normal growth. Technological advances realized during the war have given impetus to the increased use of electricity in the processing of steel and its alloys, chemicals, synthetics, and for the manufacture and use of electronic equipment. It is estimated that WPL sales will increase about 6% per year under normal business conditions.

Near-Term Forecasts

However, WPL sales fluctuate directly with the ups and downs of business. To facilitate the problem of forecasting the business cycle for near-term years, an index has been developed to measure industrial activity in Public Service territory as shown on Fig 3. The index number at a given time is the ratio of actual WPL sales corrected for seasonal and calendar adjustments to the long-term trend. The areas above and below the normal line are approximately in balance for the period 1905-1940, inclusive. Fig 3 also compares this index with a national business index, indicating the close correlation between industrial activity in our territory and in the nation as a whole, particularly with respect to turning points in the business cycle. Having once extended the index, an estimate of WPL sales may be derived directly by multiplying the index number by the corresponding long-term trend value.

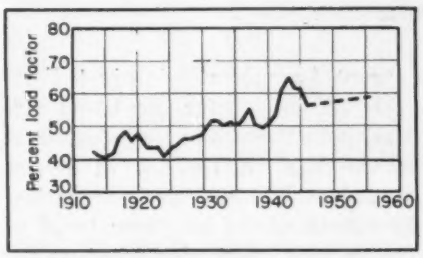


FIG 4—ANNUAL system load factor

When a new industrial customer desires electric service or a present customer plans a large increase in his requirements, a power application is prepared by the local power representative. The size and number of power applications provide tangible guides to the outlook for business in our territory. About two-thirds of the power load applied for is eventually connected to our lines, but because of the diversity between customers' loads, the addition to system peak load is less. For every 100 kw of power applied for, it is estimated that the system peak is increased by roughly half that amount. The receipt of large numbers of

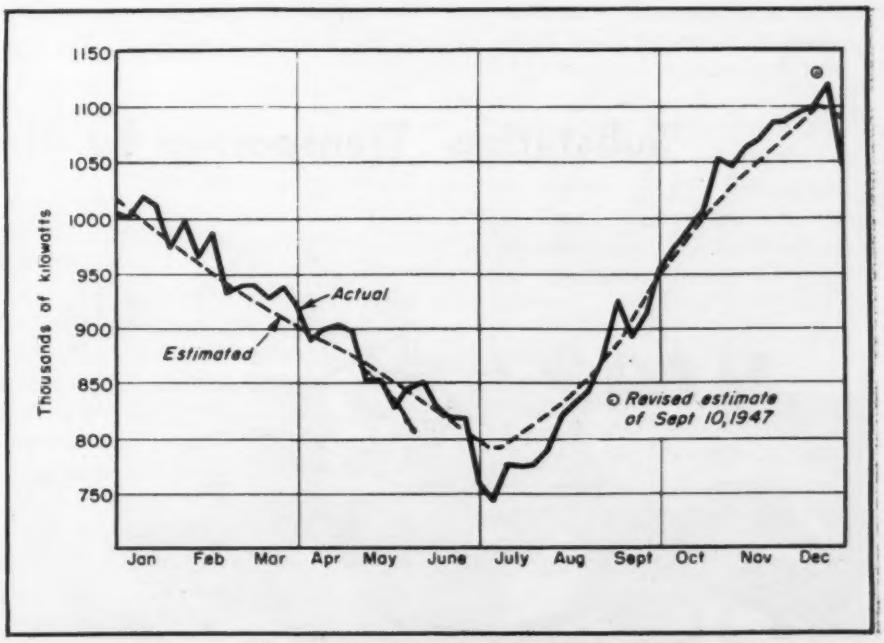


FIG 5—1947 weekly system evening peak loads—actual and estimated

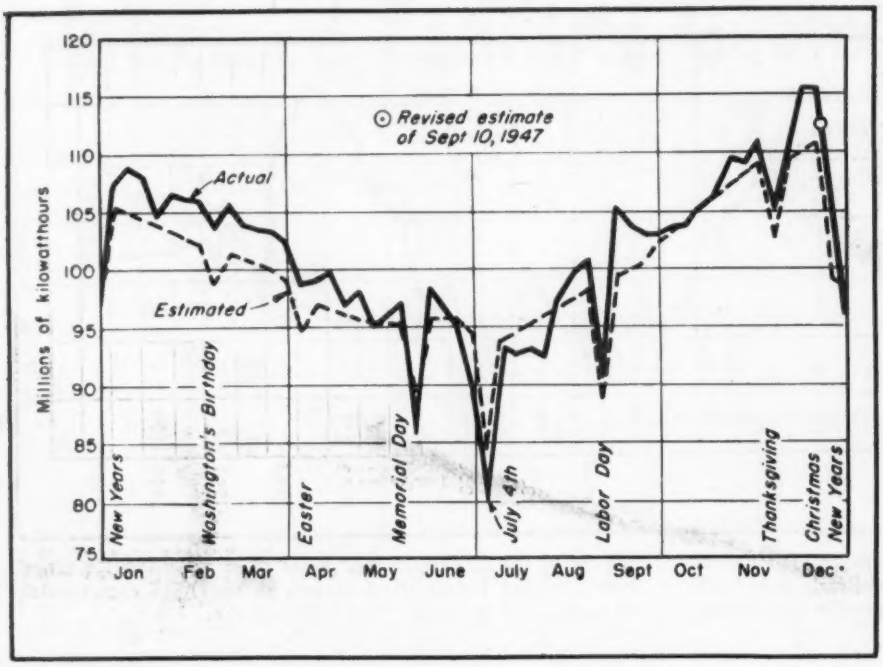


FIG 6—1947 weekly kilowatthour output—actual and estimated

power applications is an indication of confidence, expansion, and prosperity, while few applications and cancellations point to conservative spending and less optimism about the future.

Residential, commercial, and industrial sales amount to 80% of the total kilowatthour output requirements. Each of the remaining components is small, and for the most part they are forecast by direct extension of past growth tendencies.

The relatively stable correlation between kilowatthour output and system peak kilowatts, commonly expressed in terms of load factor, is presented graphically in Fig 4. Forecasts of load factor are based primarily on the gradual upward slant of the line. A forecast of system maximum kilowatt load is checked by extending the long-term trend of system peak, modifying forecasts for near-term years for anticipated cyclical variation.

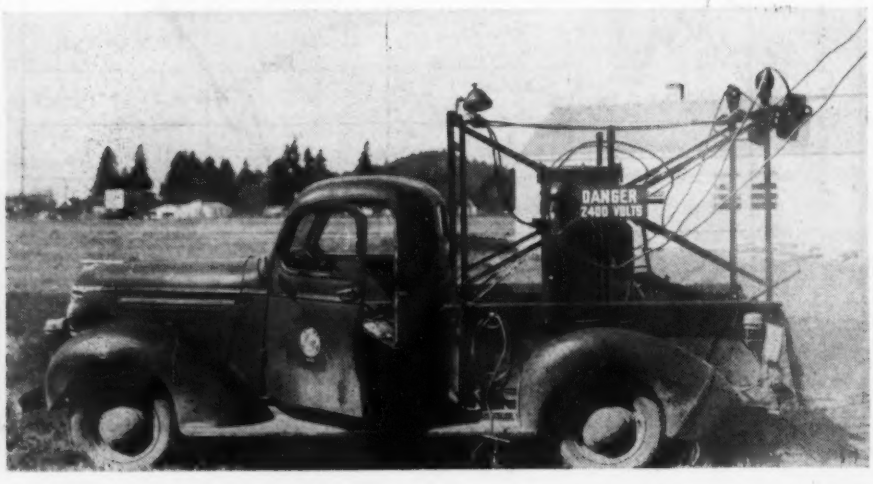
Substation Loads

Careful study of substation loads is made possible by the preparation of 24-hr load curves each month for each of the more than 150 substations by substation operators and others in the electric department. The annual peak of each substation is forecast individually because of the vast differences in characteristics and growth patterns between substations. Peak demands at substations serving predominantly residential lighting load invariably occur from 6:00 to 7:30 pm on Christmas Eve or the evenings of Christmas week, and are easily forecast by inspection of their normal yearly growth.

On the other hand, industrial and commercial load substations require analysis of normal growth and applications received for new or additional power supply. The nature of the new load requires investigation. For example, a 1,000-hp machine operating continuously in a manufacturing process will add more to the peak of the substation from which it is to be fed than will four 250-hp machines operating sporadically. Again, the addition of air-conditioning load to two substations, one having a summer peak and the other a marked winter peak, will increase the peak load of the first substation but will cause no increase in the peak of the second.

Throughout the year, actual system, substation and area loads, and kilowatthour sales and outputs are compared with estimates. Fig 5 and 6 are examples of a week-to-week check of estimated system evening peak and weekly output. Weekly estimated values were developed from the committee's 1947 Spring Forecast, using indexes of monthly, weekly, and holiday variation based on long experience.

"Substation" Transported by Pick-up Truck



MOBILE EMERGENCY "substations" of this type find frequent use on system of the Pacific Power & Light Co. Portland, Ore. A 50-kva 2,400-volt transformer is shown mounted on a pick-up. Framework supports cutouts and primary and secondary leads. **Uses:** Feeding in on a banked secondary to pick up load while a transformer is being changed; temporary feed while changing an isolated transformer; emergency feed for a burned out transformer. **Advantages:** Provides low-cost temporary source of power for many uses; does not permanently tie up a piece of automotive equipment. Two transformers are connected in open delta or wye for three-phase service

HOW TO DESIGN • CONSTRUCT OPERATE • MAINTAIN

A. CABLE SPLICING truck adapted from commercial "milk-wagon" body by Los Angeles Department of Water and Power. Head room. Interior space and shorter overall length are features

B. INCREASED SAFETY in the field is provided by avoiding any drawers or compartments opening into traffic. Red blinker lights front and rear serve as effective warning to street traffic.

"Milk-Wagon" Truck for Cable Splicers

J. R. KELLEY
Engineer of Underground Distribution
Los Angeles Department of Water and Power

"MILK-WAGON" type bodies have been adopted by Los Angeles Department of Water and Power for underground cable splicing trucks, with excellent results. Ample head room, roomier interiors and shorter overall length are the most important advantages of this type body. As a result of these advantages, greater safety, economy and convenience have been obtained by adaptation of the commercial high-headroom type body to this service.

Underground cable serves many concentrated industrial and commercial areas, as well as certain residential areas in Los Angeles. Because of the considerable distances separating these areas, it has been found more economical to furnish detached cable-splicer crews with fully equipped service trucks. After many years of experience with various types of bodies for this service, this one type has been adopted. Usually a standard chassis and body are purchased from the manufacturer. Fabrication and installation of drawers, bins, compartments, blinker lights, extra seats and other equipment is done by Department shops.

The following items of equipment and truck construction are standard on the trucks as put in service: (1) Oscillating red blinker lights, both front and rear; (2) material, tools and equipment stored inside of truck and taken out rear door for use, avoiding hazard of opening drawers into traffic; (3) compartments for special equipment, such as portable water pumps, ladders and water jugs; (4) drawers of aluminum with ball-bearing rollers; (5) plugs for extension cords to furnish energy for lights and small hand tools; (6) vise at rear entrance of truck; (7) four seats for employees, including driver's seat which can be pushed out of way; (8) full vision front and side from driver's seat; (9) ample head room and lighting inside of truck; (10) low truck body for easy entrance; and (11) short wheel base and turning arc.

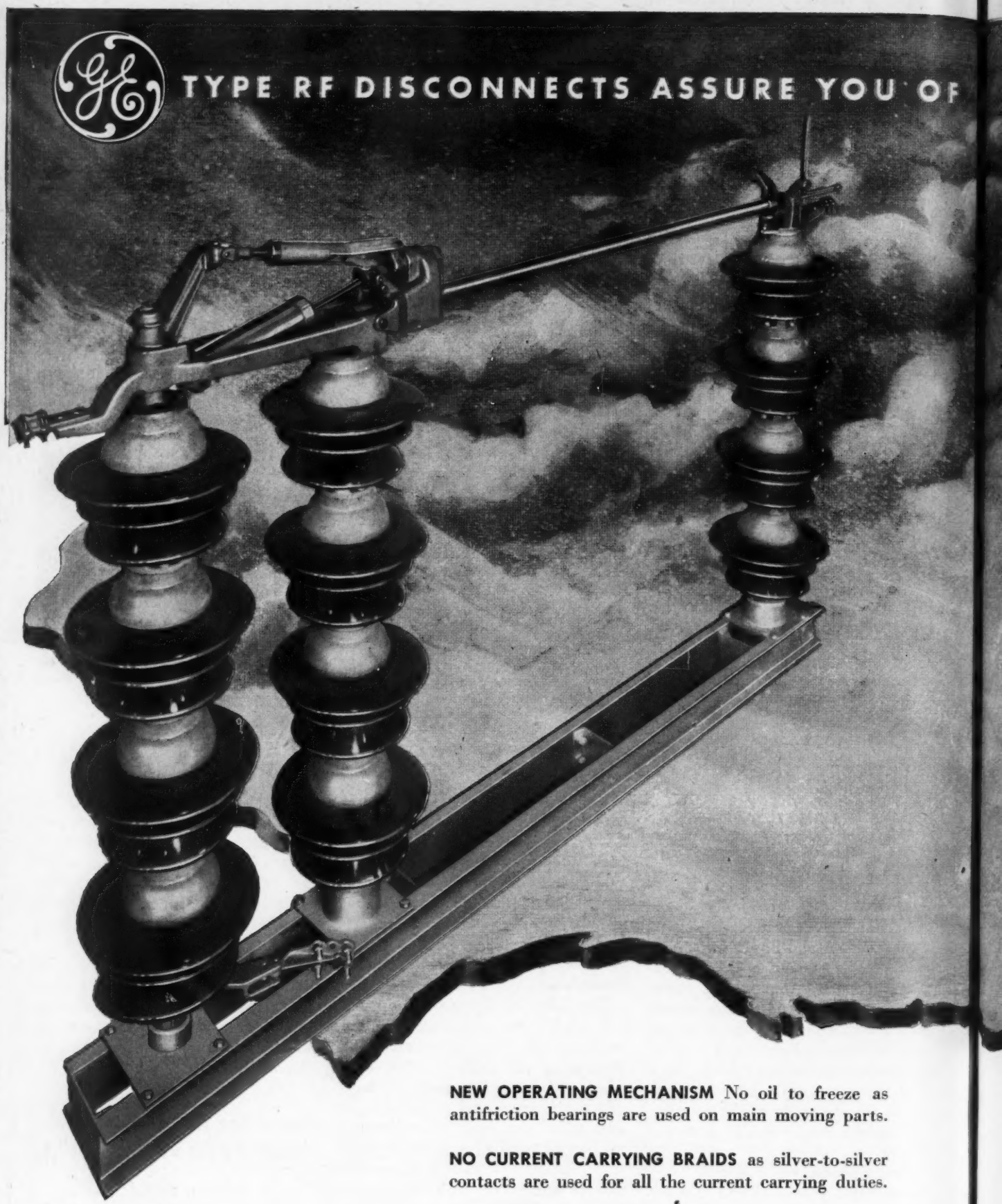
This type truck has been in use for more than 8 months by the Underground system of the Department. Reports from cable splicers on the job indicate it is a big improvement over any previously used.

Capacitor Installations Can Be Free From Trouble

SAM H. POLLOCK
Assistant Supervisor Engineering Dept
Kansas City Power & Light Co.

CAPACITORS are one of our least troublesome operating units. This wasn't always so. But by treating them as component pieces of pole

TYPE RF DISCONNECTS ASSURE YOU OF



115KV, 161KV and
230KV SERVICE

NEW OPERATING MECHANISM No oil to freeze as antifriction bearings are used on main moving parts.

NO CURRENT CARRYING BRAIDS as silver-to-silver contacts are used for all the current carrying duties.

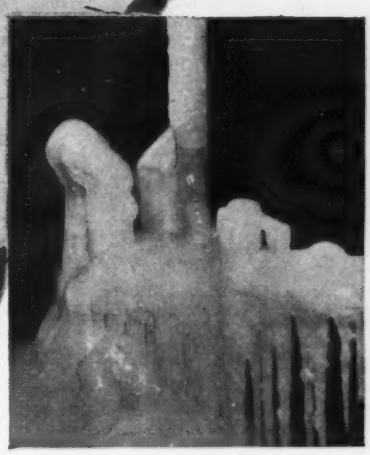
CONTROLLED-CONTACT PRESSURE No chewing or scoring of contact surfaces with the Type RF disconnect. See your G-E sales representative for further information about the new Type RF braidless disconnecting switch. Write for bulletin GEA-4980. *Apparatus Dept., General Electric Co., Schenectady 5, New York.*

POSITIVE OPERATION

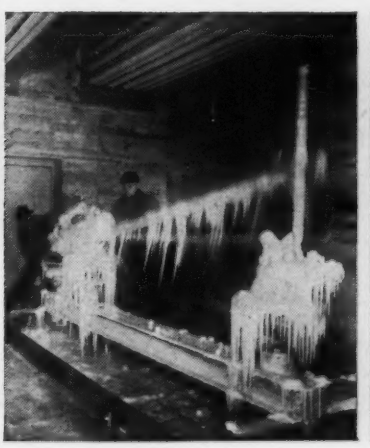
under 'glaze storm' and other severe weather conditions

ORDER NOW
prepare for
next winter

Storm Map Prepared From Weather Bureau Information



Contacts frozen into a solid block of ice

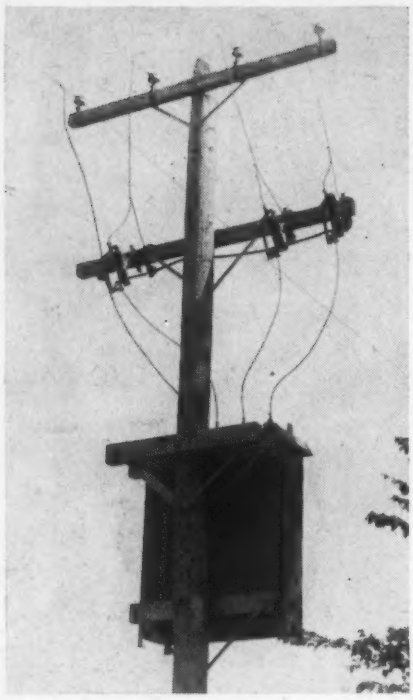


Blade slashes down to closed position

Blade cuts ice, locks firmly in position

GENERAL ELECTRIC

853-2



180-KVA, 3-PHASE, 2300/4000 volt housed capacitor installation is mounted on three 4x6 in. by 6 ft timbers and weighs about 1,300 lb. Dropout type cutouts and lightning arresters are mounted back-to-back. Neutral, on extreme left, being multi-grounded, is cut straight through without a switch. Capacitor bushings are well protected from such things as rocks.

equipment rather than as isolated pieces of apparatus, standards for construction and procedures for maintenance were developed. These resulted in trouble free and safer operation.

Experience with a large number of banks on the 4,000-v, wye, 4-wire distribution system dictated the standards. The main points covered are: (1) Units are installed in banks of 180 kva; (2) all units employ housed mountings; (3) 2,300-v units, connected phase to neutral, are used; (4) dropout type cutouts with 30-amp type N low-temperature fuse link are utilized; (5) lightning arresters are provided; (6) cases are grounded; and (7) supporting timbers are 4x6-in. throughout.

Load reduction on substations and feeders has been the primary consideration in using capacitors. Thus, it was decided to install them in banks of 180 kva. All are obtained in housed mountings. We believe the cost of painting and maintaining one large housing is materially lower than it would be on twelve 15 kva units. One large housing also makes a neater appearance on the pole.

We have always insisted that units in the case be rated at 2,300v and connected between a phase wire and the neutral. This is because single-phase switching is used on these lines and feed back must be prevented. Also there is the possibility of setting up a resonant condition with one phase out when using 4,000-v units.

Although fusing with a 30-amp type N low-temperature link is working the fuse very close to its rating, 10 years of trouble-free operating experience have proved its feasibility. The cutout used is of the drop-open type. This gives definite indication, clearly visible from the ground, when a fuse link is blown. All linemen are instructed to replace any that are blown as soon as noticed and report these to the office.

Lightning arresters are placed at each capacitor. They represent an investment of about one-fourth of one percent of the capacitor cost.

Capacitors are all pole-mounted and hung on three 4 x 6-in. timbers; double arms are used in the hanger position and a single in the kicker.

All cases are grounded; this being the linemen's preference. Climbers have strict instructions against working on a bank unless it has been disconnected and all terminals shorted and grounded when work is done on the site. It is repeatedly emphasized that the short-ground connection must remain on the terminals until all work is completed. General procedure, however, is to bring the unit into the shop for repairs. This is the simpler and more economical method.

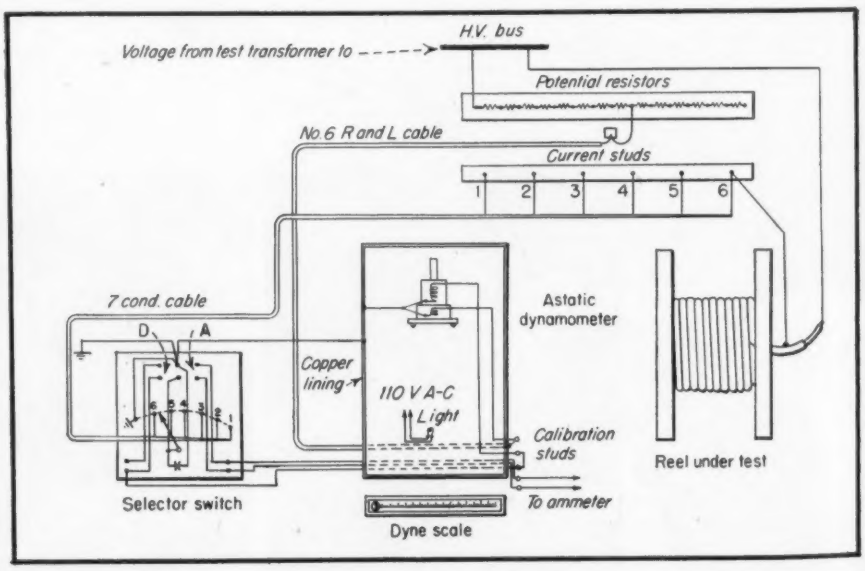
Our preference is for housed units. This is particularly true since finding several rusted housings in industrial areas but with the capacitor units inside still in perfect condition. It was a simple matter to scrape and paint the housing compared to repainting the many individual units.

Salvaging Used Cable (III)*

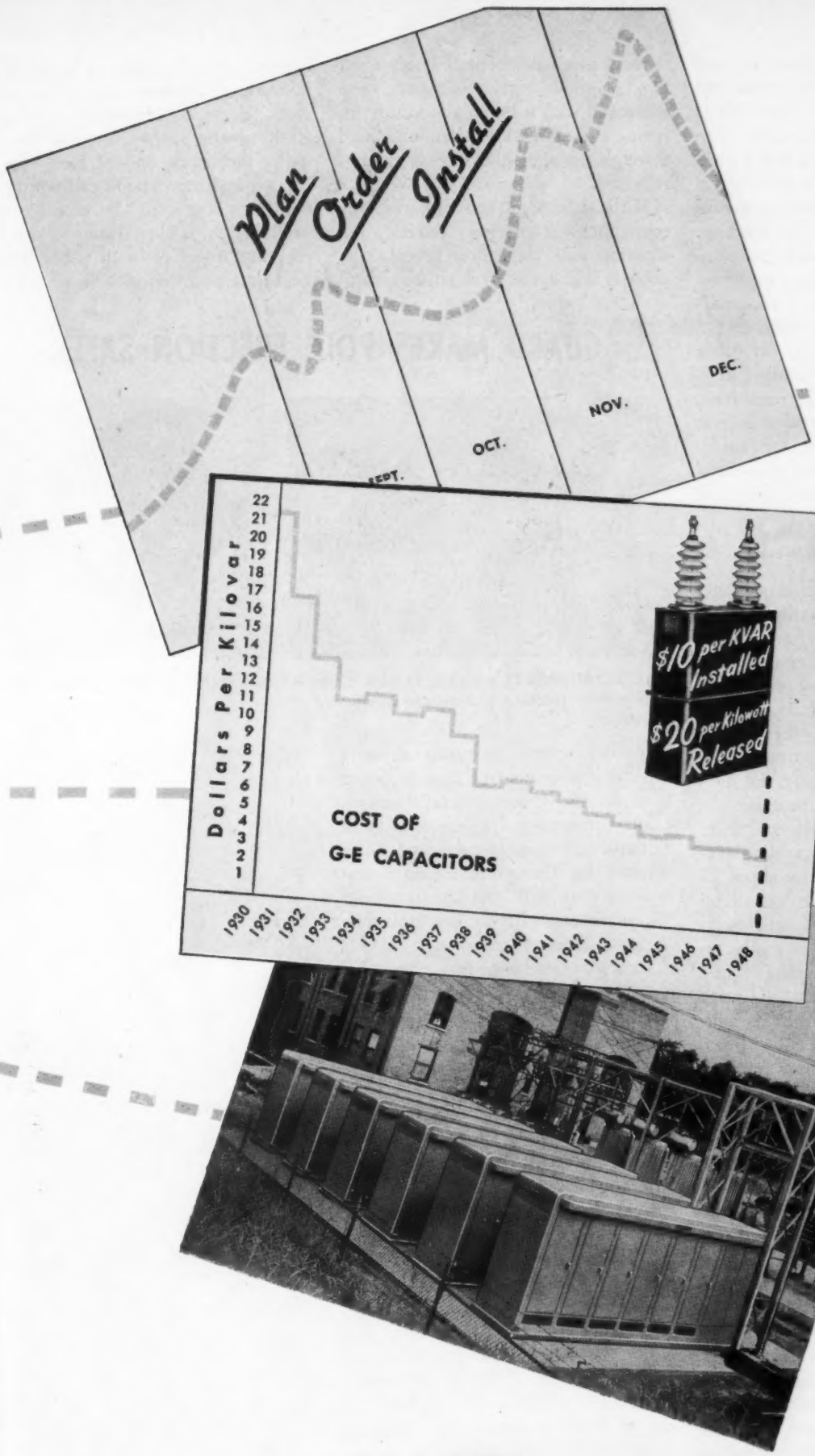
W. H. MEADE
Technical Standards and Test Section
Boston Edison Co.

ELECTRICAL TESTS in connection with cable salvage include high-voltage, power-factor and continuity measurements. The first represent about 80% of factory test voltages. Power-factor measurements are made on all cables provisionally rated at 15 kv or over. Measurements are made at the start and finish of a 15-min test at

* Continuation of a five-part serial which began in EW, July 31, 1948, p 116.



CONNECTIONS for cable power factor test. Six reels can be tested in rapid succession by setting a selector switch to connect with the corresponding reel number on a current stud bank. Watts loss is obtained from the calibrated scale of a shielded astatic dynamometer. Current is usually measured by a milliammeter. Voltage used in power factor testing is supplied from a high-voltage bus. Potential for the dynamometer is supplied from that bus through a multiplier composed of a variable potential resistor assembly



Quickly You still have time to plan, order and install G-E capacitors to release extra system kilowatts for the December load peak. G-E application engineers will be glad to work with you. Your capacitors can be shipped promptly—usually right off the shelf!

Economically Yes, $20 per kilowatt released. For example, a kva-limited system with a peak load of 100,000 kw at 85% power factor can deliver 112,000 kw after installation of 25,000 kva of capacitors. The extra 12,000 kw cost about $20 each.

Dependably Over ten million kilovar of G-E capacitors are already on the job—reducing losses and releasing system capacity in industrial plants and utility power systems. Their long-term record of on-the-job dependability is as remarkable as the high rate of return which their owners are enjoying on their capacitor investment.

GENERAL ELECTRIC

497-6

20 kv between all conductors and sheath. If the power-factor at the end of this test exceeds 1.5%, the cable is not approved for use above 7 kv. The shape of the ionization characteristic established by these two readings is significant. If the final reading shows an increase over the initial reading, a review of the insulation examination is in order. Cases have occurred where a combination of these conditions, none of them serious, could account for this increase. In other instances where abnormally high power factor has been measured, sheath inspection has revealed defects allowing water to enter the cable. Sufficient information has now been obtained to justify the assignment of a final voltage rating.

Cleaning and Sheath Work

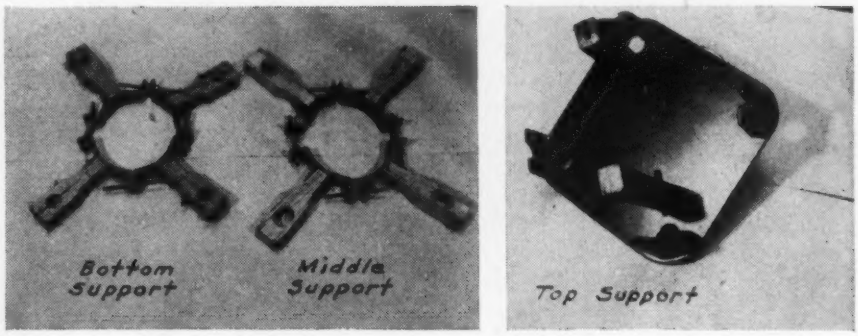
In paper and lead cable salvage, this is the final step. Sheaths are usually covered with dirty hard grease remaining from the pulling-in operation. This must be removed before inspection. Such work is usually done by men who would otherwise be idle during storms or extreme cold. It is hoped later to justify the construction of a washing machine. At present the cable is transferred from one reel to another by a reeling machine. Two reels are set up about 25 ft apart. The men apply transil oil to the sheath, using stiff brushes to soften the grease. This is easily removed by wiping with coarse burlap.

As sections are cleaned, the sheath is examined for such defects as pulling scars, splits at the flow lines, electrolysis and corrosion pitting, poor welds and wrinkles. If the defects are not too numerous, the inspector, who is also a cable splicer, may repair them by lead burning. If holes are found which extend completely through the sheath, a band of lead is removed to allow moisture tests to be made at this point. Moisture found must be removed. This may be done by cutting both ends thus formed; or by removing a section of lead sheath, removing the wet insulation, boiling out the section and reinsulating. The lead sheath section is then replaced by lead burning. This latter method is used only when moisture is confined to a small area.

Holes, gouges or scores extending over one-third through the sheath thickness are filled by lead burning to slightly more than one-third through the original thickness and then smoothed with a lead rasp. Minor injuries extending less than one-third through the sheath thickness are not repaired.

If the defects are too numerous for economical repairing during the washing and inspection process the cable is laid aside. It is either recommended for releading or is repaired at some convenient time when such work does not interfere with the washing and inspection process. Finally, the inside end of the cable is capped and the outside end equipped with a pulling eye. The actual measured length is then stamped on the reel tag, together with other pertinent data and the cable is stocked.

GUARD MAKES POLE ERECTION SAFER

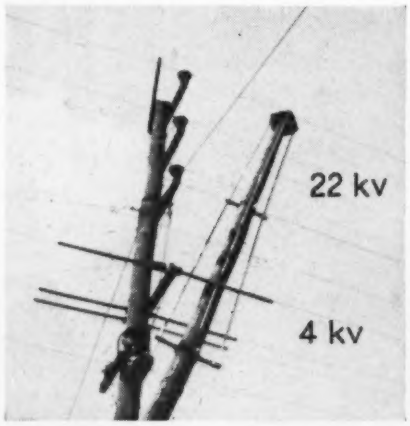


SPECIAL SUPPORTS attached to pole clamp a "cage" of switchsticks around pole to keep it from touching high-voltage conductors

ACCOMPANYING PICTURES show a type of "pole guard" that is being used on the Pennsylvania Power & Light Co system for erecting poles through and close to energized 22-kv conductors. The guard makes it unnecessary to "kill" the line or spread the conductors with hot-line tools during pole setting operations.

Basically the device is a scheme for clamping a cage of high insulation strength wood longitudinally around the circumference of any pole to keep it from touching high-voltage conductors during erection.

The cage used by PP&L consists of four 1½-inch by 18-ft switchsticks clamped in position, about 8 inches from the surface of the pole, by three special supports. The top support is an 18 inch square bakelite plate ½ inch thick with holes at the four corners to hold the switchsticks. This plate is bolted to the top pole gain by a pair of wooden lugs that can be slid along the diagonal of the plate to adjust for poles of different diameter. The middle and bottom supports consist of radial wooden arms fastened to adjustable pole bands and drilled to take the switchsticks. Arms of the bottom support are slit and provided with ring nuts for clamping the switchsticks.



POLE GUARD allows new poles to be erected through 22-kv conductors without de-energizing the line or spreading the conductors with hot-line tools

Pole erecting crews are furnished with enough top supports so that they can set a number of poles in succession. When a particular pole has been set, the top support is left in place. The sticks, middle and bottom supports are removed. A hot-line crew, coming along later, removes the top support before transferring the crossarms and conductors from the old to the new pole. Otherwise the circuits are de-energized during a light-load period and the crossarms and conductors transferred on a wholesale basis.

What's new in GE street lighting

a Better Clamp Band

for those who want replaceable glassware

For modern street-lighting luminaires, where users want optical units—reflectors, and globes or refractors—with which replacement glassware can be assembled in the field, General Electric offers a clamp-band type of assembly. This unit approaches spun-sealed assemblies in providing a tight seal which is virtually bug proof and dust proof, and is highly satisfactory in keeping globe free of moisture.

We use a globe or refractor with a double bead—and a reflector with a lip that extends to the very bottom of the lower bead. The clamp band overlaps the lip and makes a tight joint by holding the glassware against the reflector flange. The result is a firm seal regardless of irregularities in the glassware. Any moisture drawn in under the clamp by capillary action, or by heating and cooling, is trapped between the beads and cannot be drawn into the globe itself. Three drain holes—in the lower part of clamp—drain off any trapped moisture. Under tests conducted in accordance with the AIEE standard water test for insulators, no water appeared inside the fixture.

Clamp-band assemblies are available for standard luminaires up to 10,000 lumens. However, user's records indicate that spun-sealed assemblies are by all odds the preferred type. Costwise, they are unbeatable: new glassware *plus* reconditioning of reflectors for spun-sealed units have averaged 1¢ per luminaire per month—with no user reporting costs as high as two cents.

F. M. Spaugh, General Electric commercial engineer for street and highway lighting, examines a luminaire with clamp-band assembly.

GOOD STREET LIGHTING BUILDS GOOD WILL

The dependable G-E clamp band is one of many improvements which General Electric has pioneered to help provide better street lighting at less cost. For additional information on spun-sealed and G-E clamp-band types, call your Apparatus office or write *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

GENERAL ELECTRIC

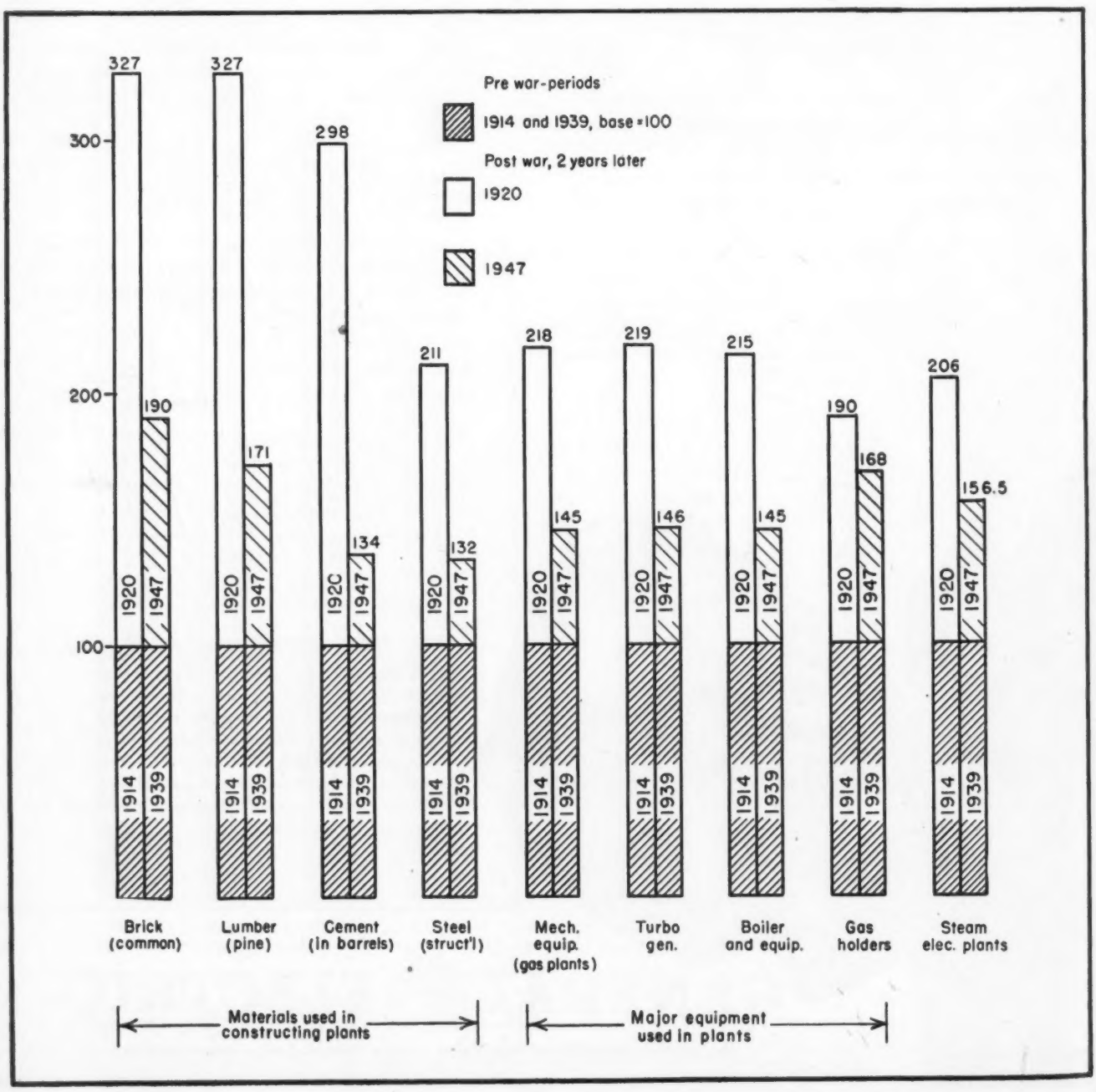
452-TB

Are you tying in with the NEMA plan to give America better street lighting?

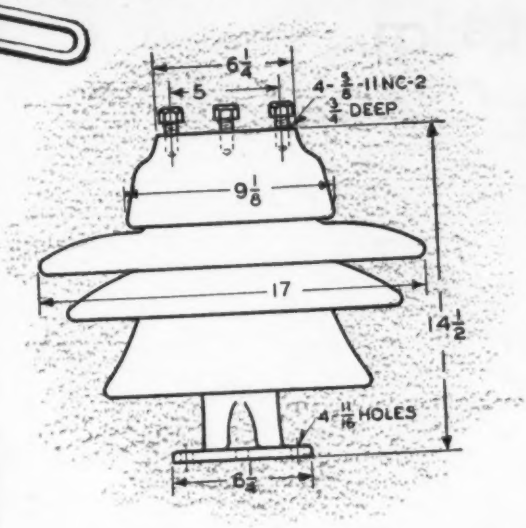
Cost of Materials, Major Equipment and Steam Electric Plants

Chart shows relative rise in costs for last two post-war periods, covers four principal construction materials, four major classes of equipment and overall costs of steam electric plants; based on construction costs for utilities

From "The Upward Trend of Construction Costs" by F. C. Gardner,
Vice President, Ebasco Services Incorporated, New York



This is O-B's No. 31152 Station Insulator



IT'S TOUGH—
IT'S PRECISION BUILT
IT'S A GOOD INSULATOR
—And It Must Be All of These

Check Your Standards

This O-B unit is a BIL stacking design for 115-kv ratings and above. It may not show on your present Purchasing Standards. It would pay you to check them now.

In O-B's No. 311 52 station insulator, you get ALL THREE...

FIRST, a high-voltage dielectric of the finest basic quality.

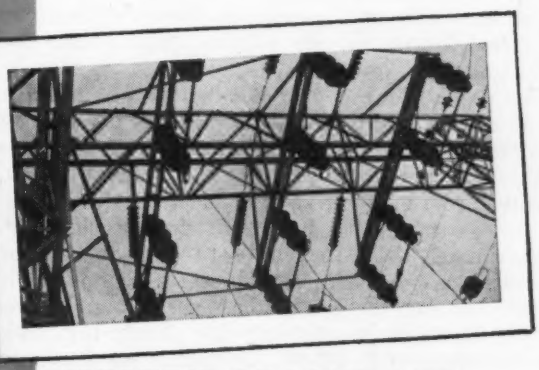
SECOND, high mechanical strength to resist torsional, cantilever, shock, and thermal loads.

THIRD, dimensional accuracy to maintain true alignment of associated parts, and proper fit at all points.

...It's an insulator in every sense of the word, but it may also become a part of a working mechanism, and it must do each job unfailingly, exposed to all extremes of climate.

No wonder all station insulators aren't alike! They may look alike when new; may test alike the first day, but they don't act alike years later. Some live longer and better than others.

Men who use O-B station insulators will confirm this. Their own experience has guided their repeated specification of O-B for both new switches and bus supports. Cash in on this experience--for many years to come you'll be glad you did!



SPEAKING OF LONG LIFE...
These O-B switch insulators are now 31 years old; still doing an important job on a large Southern power system.

2865-H

Ohio Brass

MANSFIELD, OHIO

Canadian Ohio Brass Co., Ltd., Niagara Falls, Ontario

Cost of Conductor Losses Quickly Analyzed from Graphs—I*

MERLE H. ATCHESON
Assistant Electrical Engineer
Sierra Pacific Power Company
Reno, Nevada

A TECHNIQUE is here presented whereby conductor losses may be quickly evaluated, and considerable aid given to the selection of economical conductor sizes and distribution voltages.

Circuit current at time of annual system peak is used as the base scale, and against this is plotted the annual cost of losses per mile of circuit (single-phase or 3-phase, as desired).

Curves may be devised and repeated for various voltages, costs and load factors. Basic curves are straight lines; all are parallel with a 2 to 1 slope on logarithmic paper.

To construct a group of such charts one of the first things that should be decided is the cost of power and energy losses.

The rates and charts shown are used mainly to illustrate the method suggested. The type of circuit and the system economics will determine the costs to be used.

In constructing the accompanying chart (Fig. 1) the following rate was assigned to the losses; $12.40 per year per kw loss at time of system peak as a demand charge plus 4 mils per kwhr for energy losses.

Next, the annual loss factor or "equivalent hours" of the type of circuit under consideration should be determined. (See De Weese, *Transmission Lines*, McGraw-Hill Publishing Co., and *Distribution Data Book*, GET—1008A, General Electric Co.).

For the consideration of losses on low load factor circuits the loss factor was taken as 16% or 1400 equivalent hours per year (hours at peak load required to produce the same conductor kwhr losses as are produced by the actual load during the year).

The choice of using the actual circuit peak or the circuit load at time of annual system peak for a basic index may present some difficulty. It is suggested that for low load factor loads, where the demand charge predominates, load at time of system peak be used, and for high load factor circuits where energy charges are likely to predominate that the actual circuit peak be used.

At the above rates the total cost of losses for low load factor loads is then $18.00 per kw loss at time of system peak ($12.40 + 1400 hr × $0.004).

Only one point for each wire size need be calculated to plot the curves.

The convenience of the chart thus obtained may be further improved by showing thereon a line representing the most economical peak load for each conductor size. (For the type conductor under consideration; bare, weatherproof, cable, etc.)

This may be done by a modification of the principles

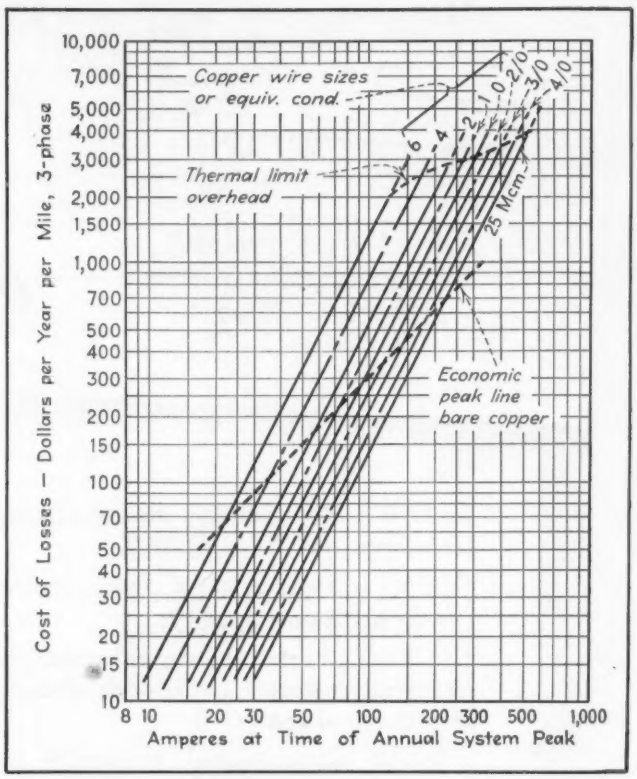


FIG. 1—COST OF LOSSES per mile of 3-phase line; conditions (a) for low load factor circuits and (b) at $18 per year per kw loss at time of annual system peak

of Kelvin's Rule—that the most economical size of conductor is that for which the investment charges are equal to the cost of energy losses (see *Standard Handbook for Electrical Engineers*, 7th edition, page 1384, McGraw-Hill Book Co., New York).

The cost of bare copper conductors was taken as 30¢ per lb and an addition of 5¢ per lb was made to account for other costs which increase with conductor size, such as additional (not total) labor, and transportation, and increased cost of clamps and connectors. (This additional 5¢ per lb raises the cost of stringing No. 4/0 wire approximately $400 per mile (3-wire) above the cost of using No. 4, in addition to the cost of conductor itself).

For locating the economical peak load line on the sample charts the annual carrying charge for conductors was taken as 15% of the conductor costs as obtained above. The annual cost so obtained is then spotted for each conductor, this being that point at which the annual carrying charges are equal to the annual cost of losses. (If a fixed cost per pound of conductor is used, as above, the economical peak load line is very nearly straight with 1 to 1 slope, being modified slightly by change of resistivity with increased conductor size. (R at 50 C, 60 cycles for charts shown).

* Concluding part will appear in a subsequent issue of ELECTRICAL WORLD.

NEW O-B COOLINE CLAMPS

Preserve Conductor and Pay Their Own Way with Power Savings

Here is a new and important development in transmission line hardware brought about by using one of the non-magnetic metals--aluminum--in clamp bodies and keeper pieces. Its principle benefits, proved by exhaustive laboratory tests, are enumerated below; while its incidental advantages include lighter weight, resistance to most forms of atmospheric attack and, of no small importance, quick delivery. . . Tangible savings in power loss can pay back your total investment in O-B Cooline Clamps, possibly several times in some cases. To this must be added the valuable intangibles resulting from greater protection to your conductors. With new O-B Cooline Clamps, hardware is no longer a mere expenditure--now it's an interest-paying investment

Summarizing the High Points of O-B Cooline Clamps

1 Heat damage to conductors at hardware points is eliminated, since temperature of conductor within clamp is lower than conductor in open air.

2 Pitting or burning of conductor within clamp, resulting from power arcs terminating on hardware, is minimized by use of similar metals in both clamp and conductor, where galvanic corrosion products do not occur to interfere with positive electrical contact.

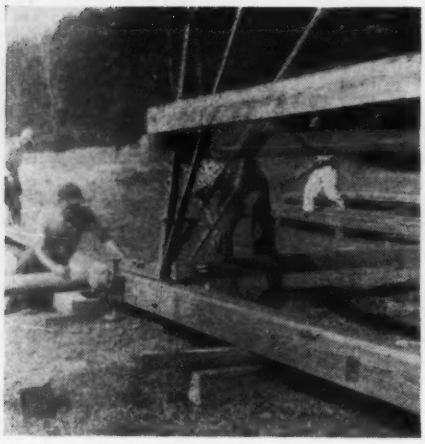
3 Direct saving of power losses by prevention of hysteresis and eddy currents through use of non-magnetic clamp material is sufficient, in most cases, to return the total clamp investment--and more--over a period of time influenced by current, load factors, and the value of the kwh.

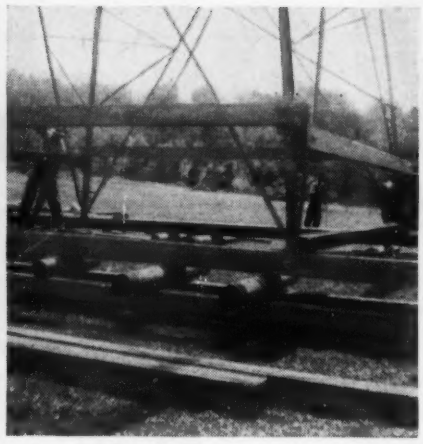
2878 H

Ohio Brass

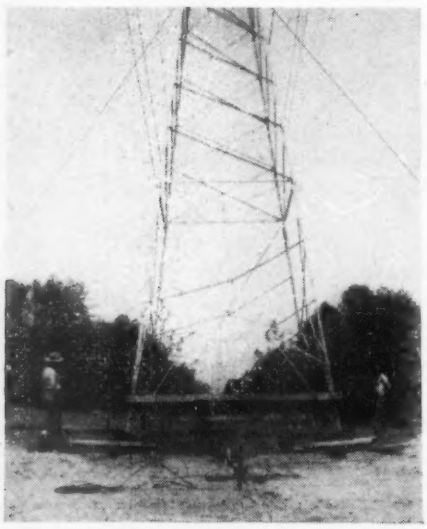
MANSFIELD, OHIO

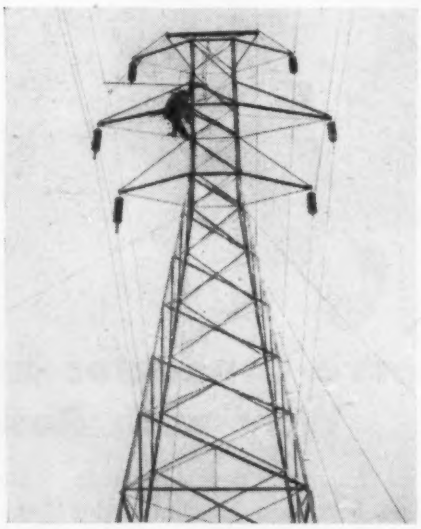
Canadian Ohio Brass Co., Ltd., Niagara Falls





THE TOWER was unbolted from its foundation, shored up with wood timbers, and log rollers were inserted between the base of the tower and the constructed runway . . . As the tower was moved (right) the log rollers were rotated





GUY WIRES were anchored to nearby pine trees and slackened and tightened as the tower moved with the aid of a power winch on a tractor . . . The energized 110 kv and 60 kv lines were supported by wooden pulleys which had replaced the insulator clamps during the relocation operation

Transmission Tower Relocated with Rollers

RELOCATION of a 75-ft steel transmission tower carrying 110 kv and 60 kv lines a distance of 86 ft, while lines were still energized, was a first for Carolina Power & Light Co. Relocation was accomplished in 61-man days with two crews to clear a fairway on a golf course near the municipality of Wake Forest.

The job was accomplished without service interruption with one five-man line crew working five days and a six-man crew working six days. The labor included hauling timber and other material from Raleigh to Wake Forest and then returning it.

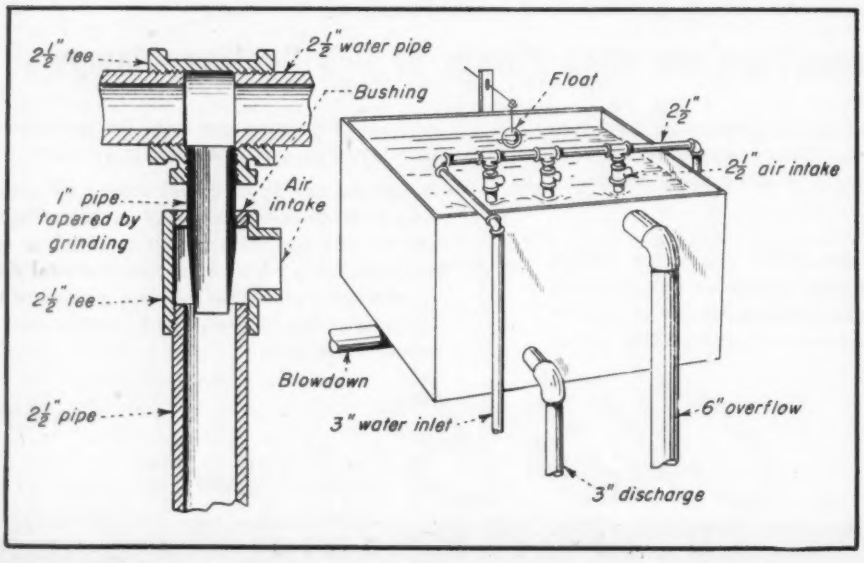
Moving Operation

The four legs of the 4,000 lb tower were unbolted and the tower shored up with heavy wood timbers and raised about five feet. Wood skids were placed along the route. Guy wires were fastened to nearby trees and slackened and tightened as the tower was moved with the aid of a power winch on a tractor. No trouble was encountered as the tower was moved over the wooden rollers.

Line clamps were removed before the rolling operation, replaced with wooden pulleys, and the lines suspended by the pulleys. Clamps were replaced after the tower was relocated on a concrete foundation.

All operations were under the direction of utility personnel.

A Method for Removing CO_2 from Softener Water



AIR EJECTOR (left) constructed of pipe fittings and arrangement for sedimentation tank

AN INGENIOUS METHOD to remove the high CO_2 from well water at the Jacksonville, Fla., municipal Talleyrand plant was devised by the Engineering Laboratory.

Thomas W. Bostwick, efficiency engineer at the plant, concluded that chemicals used by a nearby industrial paper plant, affected the surface water supply for the utility plant softener. Content of the raw water to the surge tank was 70 to 80 ppm CO_2, a high percentage. Several remedies were tried with varying success. First, spraying the water through a 3-inch pipe drilled with 200 ⅛-inch holes was tried. This had very little effect. Next spray towers, troughs, etc, were considered but these involved expen-

New CHANCE 8-way Expanding Anchor

Here is another answer to the problem of rapidly rising line construction costs! The new Chance 8-way Expanding Anchor gives you more holding power for less money.

Better load distribution makes this new Chance Anchor stronger than other expanding anchors — and the absolute simplicity of its construction makes it the most smoothly operating expanding anchor on the market.

C4816

CENTRALIA, MO., SAN FRANCISCO, CAL.

ABC INDUSTRIES

diture of funds, which were not available.

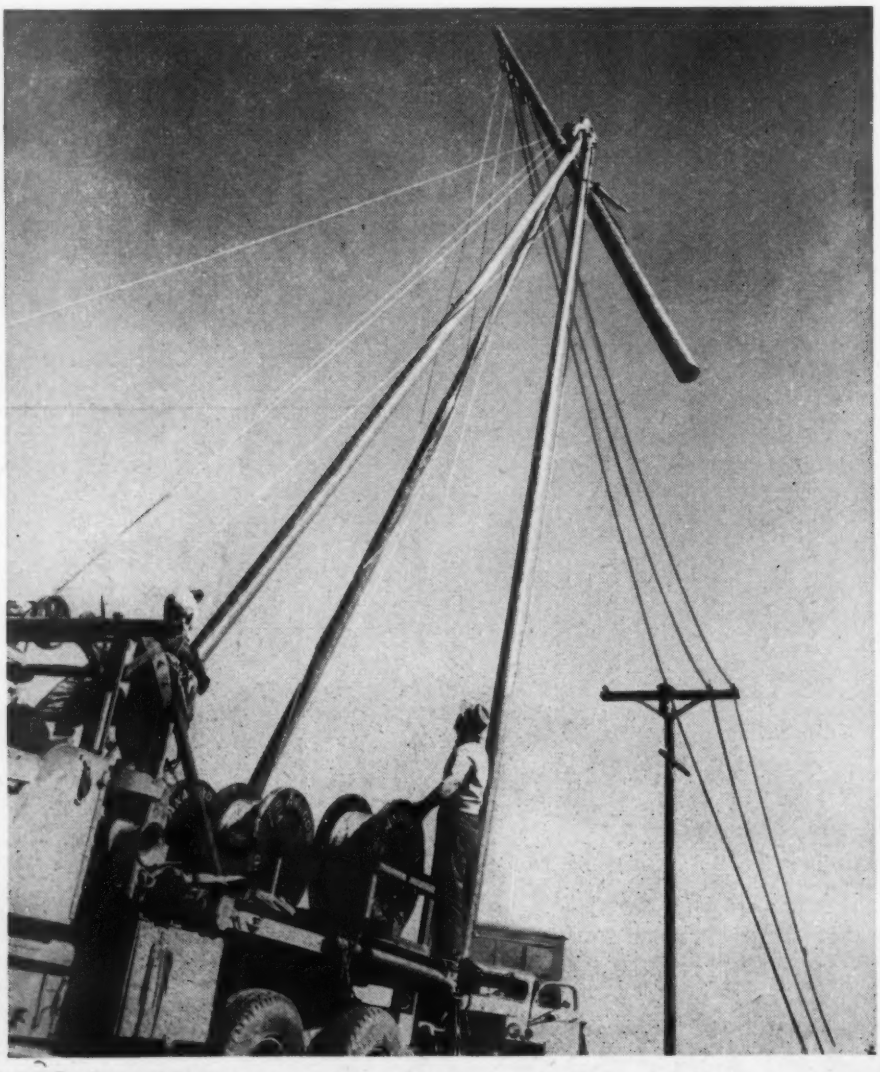
It was finally decided to try compressed air through a series of holes in a copper tube. The results of this method reduced the CO_2 by 70%. The only objection to this method was that it necessitated the operation of the station compressors 24 hr a day.

Further study was given and based on the success obtained in the design and construction of an ejector type chlorinator, it was decided to construct a simple ejector out of a pipe fitting (see diagrams). This proved highly successful and reduced the CO_2 by 50 to 60%. The device required no attention or maintenance and no expense in operation. It is believed that a sedimentation tank in conjunction with mechanical agitation would be helpful.

Pole Top Wire Stringing

STRINGING OVERHEAD CONDUCTORS directly from reel to pole tops has saved time and money on construction on the distribution system of the San Diego Gas and Electric Co. A 20-ft service pole with three snatch blocks attached is lashed to the boom of a boom truck. From reels on the truck conductors pass through the snatch blocks, are fastened in place on the end pole and then carried along from pole top to pole top as the truck move forward.

Although intended primarily for wooded terrain, the system has proved practical wherever the truck can follow the pole line, saving up to 50% in wire stringing time.



POLE-TOP STRINGING of distribution circuit is done by three snatch blocks on a service pole lashed to truck boom.

Street Lighting Changed, No Service Interruption

ALBERT GRUBER
General Industrial Engineer
The Washington Water Power Co
Spokane, Wash.

A METHOD OUTLINED here is being used by Washington Water Power Co in the modernization of a street lighting installation for a large business area in Spokane, Wash. Mechanical operations were outlined in EW, June 19, 1948, p 98.

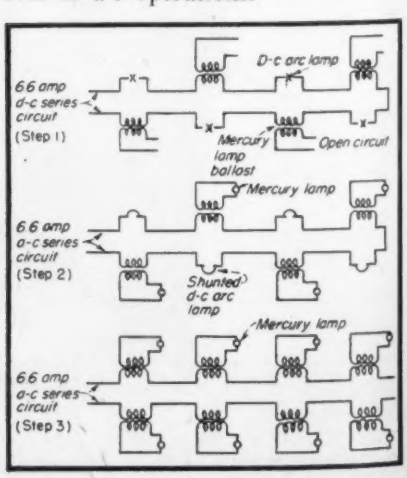
Mercury-vapor lamps replaced magnetite-arc lamps. Changeover in operation from 6.6-amp d-c lighting circuit to 6.6-amp a-c circuit is being made in three steps and with the least inconvenience in lighting service. A total of 230 lamps have been replaced and the changeover was made in 4460 man-hours or 22 man-hours per standard.

1st Step—Short out alternate d-c arc lamps and install the mercury lamp transformers (ballasts), the lamp circuits, lamp bases and luminaires. But the transformer secondary circuits were left open. Circuit operation continued at 6.6 amp d-c.

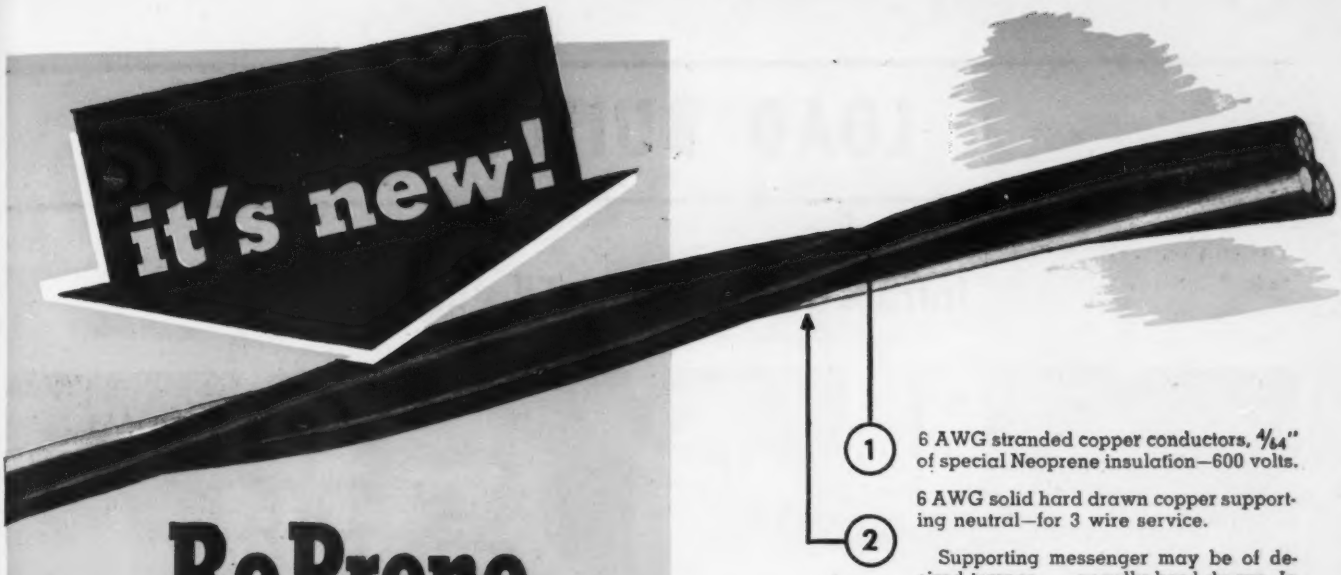
2nd Step—Short out the remaining d-c arc mechanisms and install mercury lamps. Change circuit operation to 6.6-amp a-c.

3rd Step—Replace remaining magnetite-arc equipment with mercury lamp equipment and install mercury lamps as each unit installation is completed.

Caution—Use suitable switch capacity for opening the d-c circuit when the transformers (ballasts) are installed in the circuit before changeover to a-c operations.


D-c arc lamp
6.6 amp d-c series circuit (Step 1)
Mercury lamp ballast
Open circuit
Mercury lamp
6.6 amp a-c series circuit (Step 2)
Shunted d-c arc lamp
Mercury lamp
6.6 amp a-c series circuit (Step 3)

SERIES CIRCUIT for street lighting changeover from d-c to a-c operation and without complete interruption of lighting service



RoPrene

Service Drop Cable For Economy In Overhead Services

Developed by "Rome" as an economical service cable of the self-supporting type, RoPrene Service Drop is a favor winning combination of simple construction and long life. In construction it is just this simple . . (1) power conductors of stranded bare copper insulated with Neoprene, and, (2) a bare neutral of solid bare copper as a supporting messenger. Long life expectancy has been substantiated by long time tests under all conditions of weather hazards and satisfactory operation in heavily loaded districts.

(1) 6 AWG stranded copper conductors, 4/64" of special Neoprene insulation—600 volts.

(2) 6 AWG solid hard drawn copper supporting neutral—for 3 wire service.

Supporting messenger may be of desired temper . . . usually hard drawn. In localities where a bare neutral is not permitted a double braided Weatherproof wire is recommended as the neutral conductor and supporting messenger.

Economical • 15 to 20 percent cheaper than the conventional type of Service Drop Cable.

Easy to Install • From pole to service entrance, power conductors need only to be unwrapped a few turns and taped to the messenger at terminal points with the neutral messenger fastened by through-bolts to service pole and house ends of the service. Splicing is easy with only the Neoprene insulation to be stripped.

Long Life • Long time laboratory tests have proved the excellent weather resistance of the Neoprene insulation. After 100 hours of the Weather-O-Meter cycles, alternating with 140° F dry heat, water spray, and simulated sunlight, samples have been subjected to a continuous AC potential of 4800 volts between wetted insulation and ground electrode for a minimum of 4000 hours without failure. Conventional URC Weatherproof or rubber insulated wire of equivalent wall thickness usually fails within a few hours. All mechanical tension is applied to the neutral messenger.

The breaking strength of the installed cable is equal to the breaking strength of the neutral messenger since no mechanical stress is placed on the insulated conductors.

Appearance • With conductors twisted into a single cable assembly the unsightliness of open wires is avoided.

Please write today for specification and engineering data. Ask for Specification RS-4.

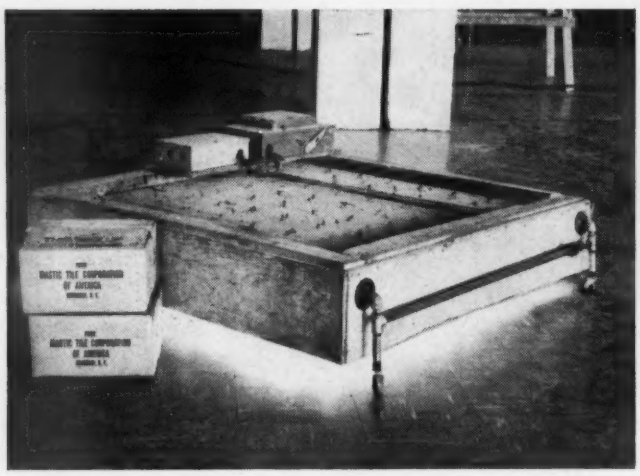
FROM BAR TO FINISHED WIRE

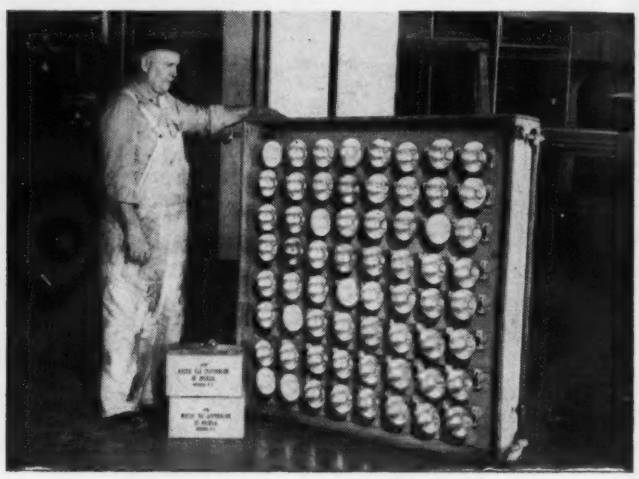
ROME CABLE CORPORATION

ROME • NEW YORK

LOAD BUILDING

Infrared Facilitates Tile Laying





WARMING MASTIC TILES ADHESIVE with electric heat prevents edge curling

H. V. RICKNER
Industrial Department
Rochester Gas & Electric Corp

AFTER SEVERAL ACRES of 12-in Mastic tile had been laid on the 15-acre floor area of the new Bond Clothing Co plant in Rochester, it was observed that the edges of some of the tiles were lifting. The adhesive was not holding properly. This was in the fall of 1947. The unfinished building was not heated and the concrete floor was cold. Adhesive requires heat.

Ordinary procedure in such cases was to apply heat to each offending tile very carefully with a blow torch, warming it, the adhesive and the concrete underneath, and then tamp the tile down. This is a slow operation, and in a job of the size of the Bond plant, it would have been very costly.

Cooperation between the electrical contractor and the utility resulted in the infrared device illustrated. An experimental unit containing 12 250-w R-40 heat lamps was constructed and tried out. It worked beautifully. From experience with it the larger rack containing 64 of the lamps was designed. The lamps are on 7½-inch centers and the castor legs are of length to hold them 4 inches from the floor. A heating period of 2¼ minutes is sufficient to soften the adhesive so that the tiles can be smoothed into secure position with a roller.

Utility Sees Ending of Rural Line Program by 1950

L. L. KOONTZ
Appalachian Electric Power Co
Roanoke, Va

ENDING of its area-wide rural line building program by 1950 is foreseen by the Appalachian Electric Power Co. By then more than 90% of the farm and rural families in the territory will have electric service available to them.

The program started in the early '20's and has advanced steadily. Line building was resumed immediately following the lifting of restrictions on materials in 1945. The company ended the year 1947 with over $20 million invested in rural service facilities. There were 12,692 miles of line in operation serving 87,744 customers. There has been a 74% increase in the number of customers and 89% increase in miles of line in operation since January 1, 1945. Cost of construction has risen sharply since the war. Lines averaging around $1,200 per mile pre-war, ranged from $2,300 to $2,500 per mile in 1947.

To complete the program, will require about 5,300 more miles of line costing about $12¼ million. Approximately 3,000 miles will be constructed during 1948 and the remainder during 1949 if present plans mature. By 1950 the company expects to have around 18,000 miles of rural line in operation serving some 125,000 customers, and its investment in rural service facilities to be over $30 million.

Building lines is but one phase of the rural electrification program. The second phase is that of advising and consulting with the customer regarding the selection, operation and care of the proper type and size of electrical equipment to meet his individual requirements. This is important

For the first time ever!

YOUR CUSTOMERS CAN GET ALL THE G-E FLUORESCENT LAMPS THEY WANT!

NO need to wait any longer! Now your customers can get all the G-E fluorescent lamps they want.

NOW'S THE TIME to help them fill those empty sockets, replace blackened, burned out tubes and go ahead with plans for lighting modernization.

FOR THE FIRST TIME since General Electric introduced this sensational new light source ten years ago, production has at last caught up with the tremendous demand.

NEW FACTORIES now in operation are turning out G-E fluorescent lamps by the millions—all manufactured to those high standards of quality that have made G-E the first choice of buyers everywhere. (Only slimline and circline are still scarce.)

WE'RE TELLING YOUR CUSTOMERS the good news with ads in leading business and consumer magazines and over the air on G-E Lamps' popular radio show, "What's My Name?" Why don't you tell them, too? On every lighting job, always recommend...

G-E LAMPS

GENERAL ELECTRIC

to both customer and company if they are to get the most return on their investments. Company agricultural engineers, rural representatives, home economists and other specialists held 957 group educational meetings and demonstrations in 1947, which were attended by 45,604 customers.

The company gives dealers 100% cooperation and urges them to do the job of supplying the equipment needs of its customers. During 1947 dealers sold and installed 15,328 electric ranges and electric water heaters on company lines, 42.8% on rural lines. In addition, dealers sold and installed 11,604 other units of farm and home electrical equipment on the company's rural lines, including such items as water systems, feed grinders, brooders, hay driers, milk coolers.

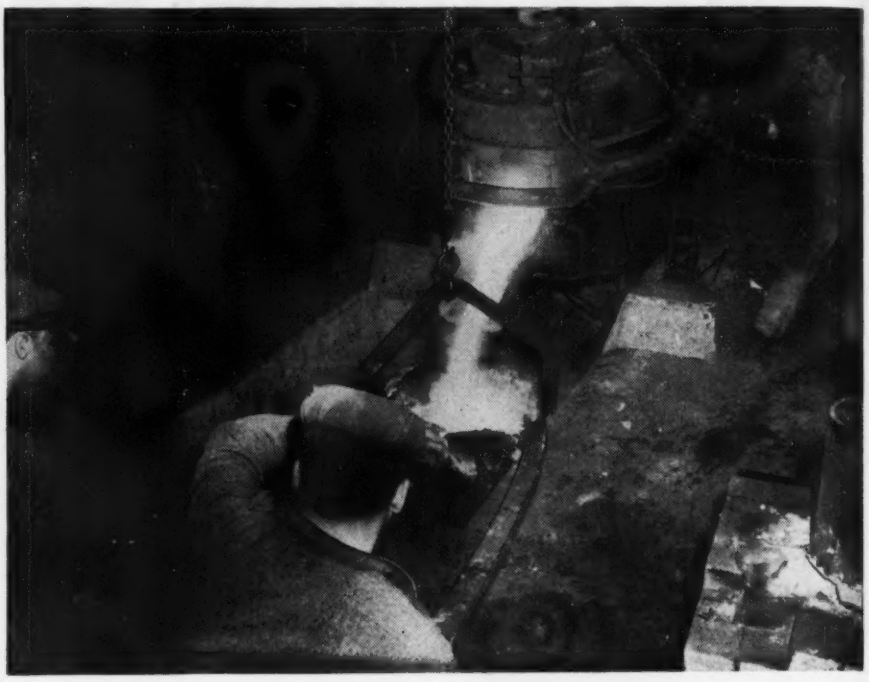
Arc Furnace Cuts Costs in Steel Melting

HARRY E. WILKINS
Power Sales Engineer
Quincy (Mass.) Electric Light & Power Co

ELECTRICALLY MELTED, steel shows striking economies in the plant of the Quincy (Mass.) Steel Casting Co. Energy is purchased from the Quincy Electric Light & Power Co. A 1,000 lb arc-type furnace rated at 300 kva has handled all the company's steel melting since November, 1947. Formerly this work was done by two 8-pot oil-fired furnaces.

The new installation produces 36 tons of steel against 21 tons by oil burning in an average month. Labor requirements are the same by either method. Formerly, it required 6,500 gal of fuel oil and 110 crucibles to melt 21 tons of steel. Oil cost 11.8 cents per gal, and crucibles $5.55 each. This made the operating cost per ton $36.5 for fuel and $28.80 per ton for crucibles. Total cost per ton was $65.30. With electric service at 2.5 cents per kilowatt-hour and an energy consumption of 40,000 kwhr for melting 36 tons of steel, the cost became $1,000 for the 36 tons, or $27.77 per ton. The cost of installing the complete electric furnace facilities was about $25,000. With savings of this type, there was no question as to the advantages of electric melting.

Electric melting provides more flexible service than the former oil-fired installation with closer control of steel quality. Although rated at 1,000 lb the furnace is run at a 1,500 lb rate much of the time. The utility provides service to this unit at 4 kv, a step-down transformer delivering energy to the furnace at 120-v, three-phase, for starting and at 90 v for the finishing-off period. The plant is equipped for production or jobbing methods in making acid electric carbon steel castings.

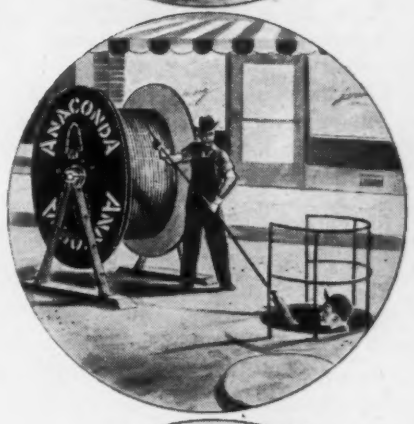


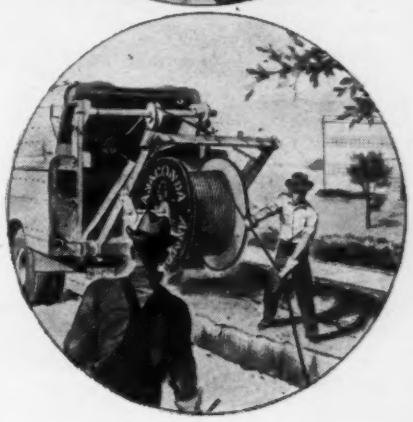
QUINCY COMPANY produces more castings for less than half the cost per ton required by former oil-fired equipment, after installing electric arc furnace.

CAPITALIZING on the rural service promotion of the Appalachian Electric Power Co, the G-M Equipment Co of Point Pleasant, W. Va, set out to reap profit by cooperation with it. The means used is a combination delivery and demonstration truck. Equipment on the truck includes a public address system, program recorder and movie projector and camera. Also included are tools and testing devices for servicing appliances and radios. G-M's R. H. Melrose works with the power company by sending the truck to fairs and rural meetings and furnishing appliances for display

PICK ANY SPOT... THEN PICK

Durasheath





FOR POWER DISTRIBUTION, you can use a single type and size of Durasheath cable—whether it's small or large—one, two or three conductors—in runs that are in the air, in conduit or directly in the ground.

ADVANTAGES IN DURASHEATH:

High tensile strength and strong resistance to flame and abrasion.

Extreme flexibility that makes handling easy.

Resistance to moisture, acids and alkalies generally found in the soil.

No problems of electrolysis, corrosion and extremes in temperature.

Write for Bulletin DM 4820, "Durasheath, the All-Purpose Cable."

ANACONDA WIRE & CABLE COMPANY

25 Broadway, New York 4, N. Y.

THE ALL-PURPOSE CABLE

Anacondaloy*-coated copper conductors are insulated with a moisture-resisting synthetic rubber compound, bound with color-coded rubber-filled tape and enclosed in a tough, high mechanical strength, moisture- and flame-resistant outer jacket of Neoprene. Conductors have the lasting protection of a solid block of synthetic rubber and Neoprene.

*Reg. U. S. Pat. Off.

ANACONDA
from mine to consumer

NEW EQUIPMENT

Tester

A NEW TESTER has been introduced by General Electronic Distributing Co, 98 Park Place, New York 7, N. Y., for testing all electrical circuits and appliances.

It measures the actual current consumption of any appliance or utility, either a-c or d-c, and will measure it

while the unit is in operation. The reading is direct in amperes. The instrument incorporates an ultra-sensitive direct-reading resistance range which will accurately measure all resistances commonly used in electrical appliances, motors, etc. This range will enable continuity checks and tests for shorts and opens. Readings can be made from a fraction of an ohm to 25,000 ohms.

•

Time Switches

HEAVY DUTY time switches produced by Sangamo Electric Co, Springfield, Ill., are now equipped with the new Sangamo-developed, fully enclosed, hysteresis-synchronous, low-speed motor. The design is said to achieve high torque and to have a replaceable bearing system. Basic time switch units can be adapted to many applications.

Minimum time between settings of the "off" and "on" periods is 90 min. Time intervals between "on" and "off" periods is 30 min. Manual tripping can be done without disturbing the automatic operation.

•

Sensitive Relay

IN ANNOUNCING a new type BK relay, Allied Control Co Inc, Dept S, 2 East End Av, New York 23, N. Y., recommend its use especially under conditions of limited power supply and also where precise operating characteristics are vital. The relay has molded bakelite insulating parts throughout. It is supplied in one-pole or two-pole, normally open or normally closed contact arrangements, also double throw.

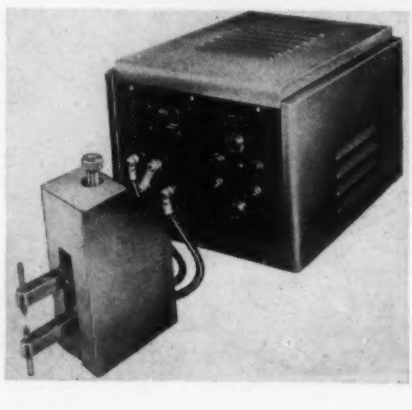
Type BK has d-c coil rating up to 32 v at 24 mw. The a-c coil rating is 220 v at 0.240 va. Contact rating is: d-c, 1 amp at 48 v; a-c, 5 amp at 110 v, non-inductive. Dimensions—2⅝ in. long by 2⅝ in. wide by 1 21/32 in. high.

•

A. C. Welder

RAYTHEON Manufacturing Company, Waltham, Mass., has announced the release of a new model of the Freshman 200 mf condenser weldpower. The Freshman is designed for high speed precision welding of both ferrous and non-ferrous metals.

The weldpower unit is electronically controlled. The level of energy delivered by the unit is adjustable over a wide range—from 3.5 to 63 watt-seconds. The weldpower is ready to operate when plugged into a 115-v, 60-cycle circuit, connected to the welding head and adjusted to the desired level of energy.

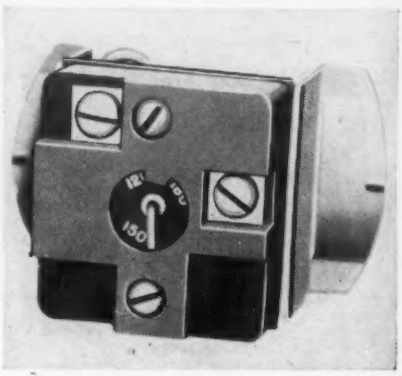


Thermostat

A NEW CLAMP-ON type thermostat for electric water heaters, engineered to reduce space and insulation waste in the heater design, is announced by Cutler-Hammer, Inc., 235 N. 12th St., Milwaukee, Wis.

The new design utilizes bellows-to-tank contact. A bracket mounted on the side of the tank permits the small thermostat to be quickly snapped into place.

The sealed vapor-filled bellows used in the thermostat has metal-to-metal contact between the bellows and the tank wall. Thus with no insulating air



gap between the water and thermostat instantaneous thermostatic reaction to temperature changes is said to be assured.

•

Fluorescent Fixture

A NEW 2-light fluorescent industrial fixture, featuring a heavy gauge aluminum wireway channel and reflector, has been announced by the Kahn Manufacturing Co, Milwaukee, Wis.

Model No. 602-E uses two 40-w fluorescent lamps, a 2-lamp ballast fully enclosed in channel, and is finished in neutral gray-green, Dura-Baked lifetime-guaranteed enamel.

•

Atomizer

A NEW MECHANICAL fuel oil atomizer with a wide range to eliminate the necessity of changing sprayer plates is now in production by The Engineer Co, 75 West St, New York, N. Y.

The Enco atomizer has a capacity

range of 10 to 1 without returning or recirculating oil which, is delivered to the atomizer at 300 psi (maximum viscosity 150 SSU).

Lamp Ballast

A LINE of fluorescent lamp ballasts has been designed for such a degree of quietness that the hum level at a distance of 6 in. to a trained ear is reported to be barely perceptible. The ballasts are recommended for use in hospitals, homes, test apparatus and low-level noise areas. They are produced by A. J. F. Industries, Inc, 852 Monroe St, Brooklyn 21, N. Y.

Core is laminated steel of dynamo grade. Magnet wire must meet specifications of four enamel coatings. All insulation is tested for freedom from corrosive properties and metallic particles. The entire transformer is impregnated and baked in a polymerizing varnish. The enclosure is drawn from 20 gage, cold-rolled steel.

Sizes available: 4, 6, 8, 15, 18, 20, single 30, single 32 and single 40 w in. both low and high power factor types.

Circuit Breaker

NEW high-speed, outdoor frame mounted oil circuit breaker, type FZO-151, in 69 kv ratings is available in interrupting capacities to 2,500,000 kva, according to the Boston Works of Allis-Chalmers Mfg Co.

The breaker is all-welded steel fabrication. It is equipped with "Ruptor" interrupting device capable of ultra-high-speed circuit interruption, and a high-speed, mechanically trip-free electropneumatic operator which permit 20-cycle fast reclosing service. Solenoid operation is also available for standard reclosing service.

Photoelectric Control

A NEW SERIES 63,300 photoelectric street lighting control with a capacity of 3,000-w incandescent lamp load is announced by The Fisher-Pierce Co, Inc, Boston 21, Mass. Models are available for both 120 and 230 v 50-60 cycles.

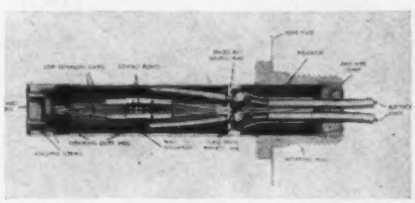
The unit is designed to control all types of outdoor lighting. Lights are controlled according to preset values of daylight intensity. The standard turn-on adjustment is 0.5 ft-c with turn-off at 1.25 ft-c. Provision is made for adjustment of the turn-on from 0.5 to 4 ft-c. The turn-off will remain approximately 0.75 ft-c higher than turn-on.

Fire Detecting Device

A NEW FIRE detecting device which combines high sensitivity, "high fidelity" response to the temperature setting, automatic repeatability plus ruggedness and long life, has been placed on the market by Fenwal, Incorporated, Ashland, Mass. Designed for universal application over a broad temperature range, the new Detect-A-Fire unit is suitable for both ordinary and explosion-proof applications.

Detect-A-Fire units can be spaced at 25-ft intervals and 12½-ft from adjacent walls. The unit is hermetically sealed against dirt, dust, vapor, penetration, oil and other contaminants.

The unit is said to be repeatable in



spite of exposure to flame for short periods. Any temperature setting may be specified up to 725 F. Standard temperature settings are 140 F, 160 F, 225 F, 325 F, 450 F, 600 F, 725 F. Electrical rating is 125 v, 5 amp a-c, and 125 v, ½ amp d-c. Two types are available: Type 10—contacts open on temperature rise; Type 11—contacts close on temperature rise.

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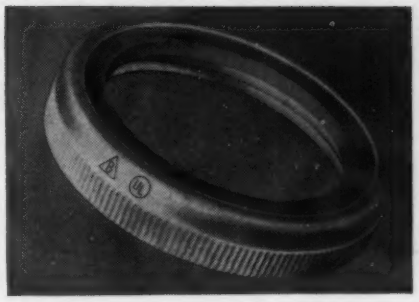
Four-Lamp Luminaire

A FOUR-LAMP fluorescent luminaire type CD-160 for schools and offices is announced by Westinghouse Electric Corp, Box 868, Pittsburgh 30, Pa. Like its companion, the two-lamp CD-80, the new luminaire is available for suspension mounting as a direct-indirect type with steel louvered bottom or as a semi-indirect type with translucent plastic bottom of polystyrene extrusion for strength and rigidity. A semi-direct distribution can be obtained by mounting the unit with louver bottom on ceiling brackets.

The luminaire is claimed to be well shielded with low brightnesses at normal viewing angles. Where maximum diffusion and shielding are required for critical or prolonged seeing tasks such as found in drafting rooms or accounting departments, the translucent bottom is recommended.

Single and twin-stem hangers are available for suspension mounting or louvered units can be mounted on ceiling brackets when required. Starters are accessible without removing the fluorescent lamps.



Conduit Bushings

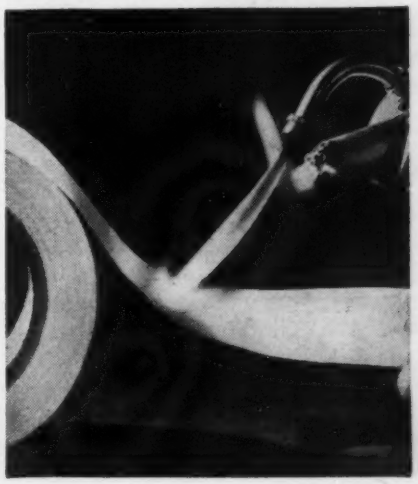
These insulated metallic conduit bushings, manufactured by Buchanan Electric Products Corp, 1290 Central Ave, Hillside, N. J., are claimed to provide protection against abrasion of cable insulation and accidental grounds. Known as "Bushends", they require no inside locknuts. Metal bases are fabricated from a corrosion resistant alloy. Threads are claimed to be non-seizing. Insulation is said to be neither fragile nor brittle. Further claims for the insulation include high dielectric strength and resistance to moisture absorption. All sizes are approved by Underwriters' Laboratories.

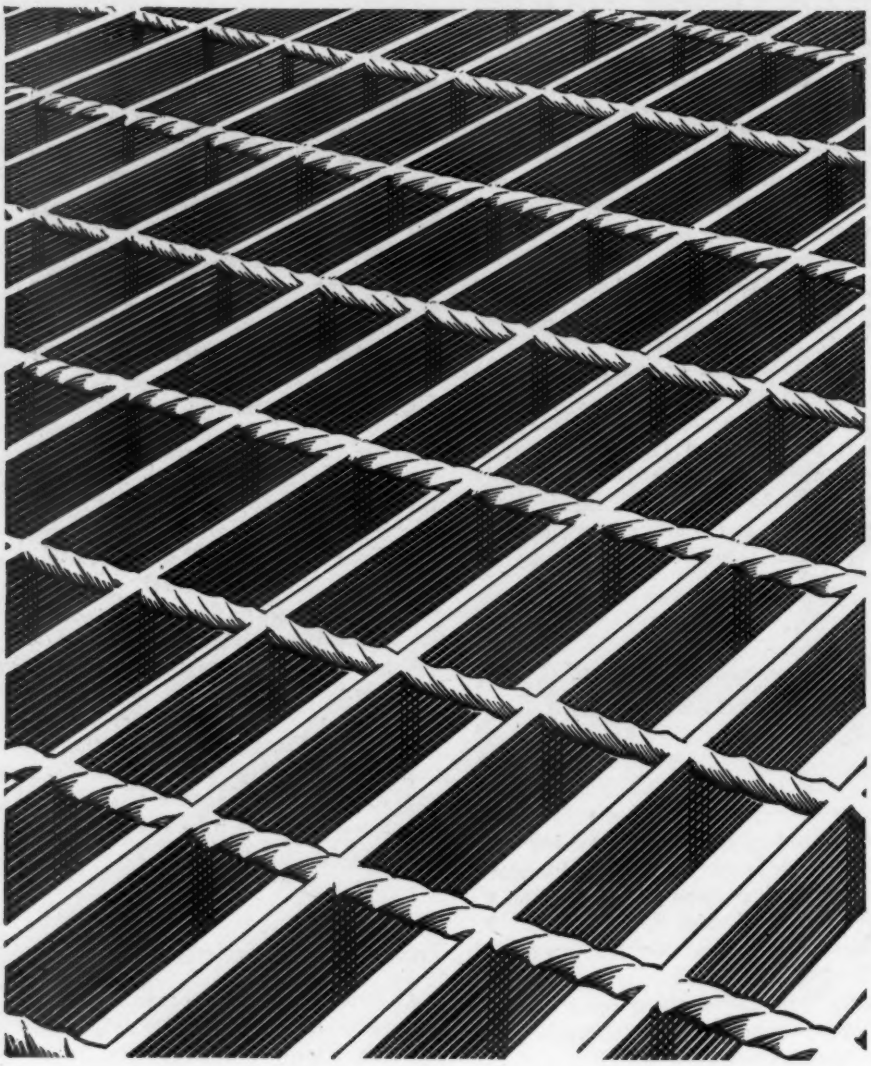
•

Inorganic Insulation

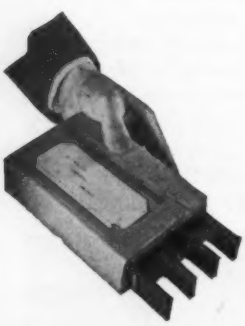
AN ASBESTOS-BASE, inorganic electrical insulation, known as Quinterra, has been developed by Johns-Manville, 22 East 42nd St, New York 16, N. Y. This new type of insulation is reported to be non-flammable, flexible, to have a closed structure and in appearance to resemble paper. Applications are wire, layer, and slot insulations, also where space factor is an advantage.

The Quinterra is said to have particular interest as an insulation where high temperatures are encountered. At room temperatures the minimum dielectric strength is approximately 250 vpm and increases to about 400 vpm at 300 C. Even at 800 C the insulation re-





SEE THOSE TWISTED CROSS-BARS?



They're electroforged directly *into* the bearing bars to form a rigid one-piece steel "material" of guaranteed strength—with safe footing at all times . . . Blaw-Knox Grating also —

★ *Provides Maximum Open Area* for light and ventilation

★ *Is Easy to Maintain* . . . easy to paint thoroughly

★ *Is Self-Cleaning*—no sharp angles to retain debris

★ *Economical to Install* in any size or shape

FREE...
So that you can have a "close-up" of Blaw-Knox Grating construction, write today for this "paper-weight-size sample" on your business letterhead.

BLAW-KNOX DIVISION
OF BLAW-KNOX COMPANY
FARMERS BANK BLDG., PITTSBURGH 22, PA.

BLAW-KNOX ELECTROFORGED STEEL GRATING

tains a dielectric in the order of 100 vpm. Sheets have been brought to bright red heat in a Bunsen burner flame without igniting or melting.

Because of the thinness of Quinterra, electrical equipment designers can save space. Thickness can be varied from a tissue-thin 1.5 mil to 20 mils. The paper-like material is available in long lengths in roll or tape form.

•

Floodlight

TWO NEW GENERAL purpose floodlights designed for small area lighting have been announced by the Lighting and Rectifier Divisions of the General Electric Co, Schenectady, N. Y. The new lights, the Type L-82, rated at 300/500 w, and the Type L-83, rated at 750/1000 w, can be used for all purposes.

A tightly sealed hinged door, which is locked by three clamping lugs, replaces the clamped ring on older types. A new aluminum reflector designed for higher beam efficiency in accordance with NEMA standards, and a locking handle on the elevation adjustment which eliminates the need for using wrenches, are other features.

Both the L-82 and L-83 can be provided with a portable base as well as the slip fitter and pipe clamp mountings. The portable base, which measures 14⅛ in. dia. is made of steel with a hot-dip galvanized finish.

•

Puller

THIS PORTABLE hydraulic pulley puller, manufactured by Industrial Engineering Equipment Co, Davenport 2, Iowa, is easily handled by one man. It removes almost any object from a shaft in a matter of minutes.

Pressure is supplied to the hydraulic

The design of Penn-Union Multifit Connectors retains the full strength and rigidity of the Everdur bolt. The saddle which provides a wide surface to grip and protect the cable is permanently fastened to the U-bolt; one piece. The strongest and most satisfactory fitting of this type. High copper content alloy; Everdur Nuts and Lockwashers as well as Bolts.

★Each Multifit Connector takes a wide range of conductor sizes; only a small stock will provide for many needs. Made in a complete range for cable up to 2,000,000 cm.

The Penn-Union line also includes numerous other types of Tees, Lugs and Straight Connectors, as well as Service Connectors, Bus Supports, Grounding Clamps, Cable Taps, etc., etc. Experienced users have found that the Penn-Union mark on a fitting is their best guarantee of satisfactory performance.

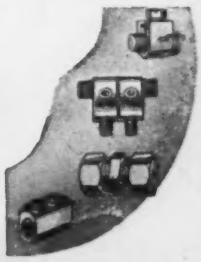
Sold by Leading Wholesalers

PENN-UNION ELECTRIC CORPORATION

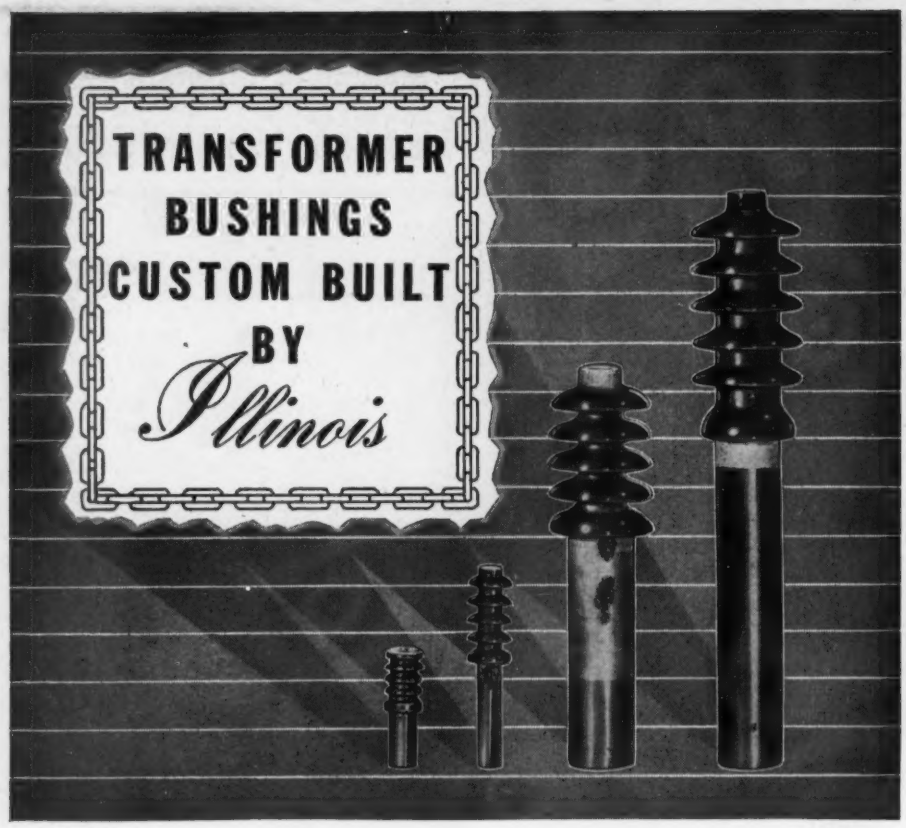
Erie, Pa.

Canada: Dominion Cutout Co., Ltd., 250 Richmond St. West, Toronto, Ontario

THE *Complete* LINE OF CONDUCTOR FITTINGS



PENN-UNION



A chain is only as strong as its weakest link. Prevent weak links in your product by using ILLINOIS bushings produced to meet your engineers' most exacting specifications.

ILLINOIS' thorough control of production methods results in the manufacture of porcelain bushings of high dielectric and great mechanical strength, with the utmost in dimensional accuracy. Careful kiln drying and firing, at constant temperatures, prevent internal stress.

These bushings can be standard glaze or radio interference-proof glaze. Dry type bushings are produced for all voltages up to 34.5 kv. Gasket seats are smooth and ground when required.

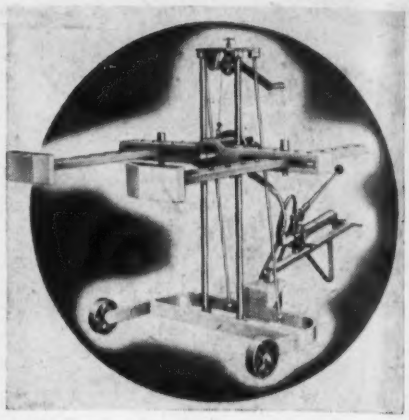
★

Complete Uniformity
Exact Dimensions
High Dielectric Strength
High Mechanical Strength

★

Specify Illinois Porcelain
for Dependability and Economy

ILLINOIS
ELECTRIC PORCELAIN CO.
MACOMB • ILLINOIS



jack by a hand pump. Three adjustments set the puller to the dimensions required. The beams, arms, jack and pump can be removed from the puller stand for overhead or other special uses.

Two models are available—the large size, mounted on wheels and exerting 20 tons pressure, and the small size on a flat stand rated at 5 tons capacity. A special ram adapter can be obtained to handle shafts of nearly any diameter.

•

Wire Insulation

NYLON-COVERED electrical wire for homes, offices, factories, and other buildings, is now being produced by the U. S. Rubber Co, Akron, O.

The new wire is said to be 30% smaller in diameter than conventional building wire. It takes up less room in conduit, permitting the use of more conductors.

Under the nylon are two layers of insulation—natural rubber and neoprene synthetic rubber. The nylon is hot and liquid when applied over the rubber. As it cools it becomes extremely hard and smooth, thus forming a hard shell and giving the conductors better protection.

The new wire is claimed to be resistant to gasoline, oil, fire, moisture, acids and light. It will be marketed under the name Neolay type RU in sizes 14, 12, 10, 8 and 6.

•

Synchronous Motor

THE PRECISION-BUILT Type SX self-starting synchronous motor developed by The R. W. Cramer Company, Inc, Centerbrook, Conn. has been redesigned to make the motor assembly (without gear train) completely self contained. This new design permits closer tolerance, control, and inspection of the rotor and field structure and this makes possible greater uniformity of the magnetic circuit.

The motor reaches synchronous speed within ½ to 2 cycles and will stop within one pole of motion on the 240

rpm rotor shaft (¼ sec) when de-energized. Patented no-back gears determine direction of rotation so that either clockwise or counterclockwise motors can be supplied to order.

Standard gear trains, ranging in speeds from 60 rpm to one revolution in 24 hours, are available, adapting motors to a wide variety of applications. Plastic gears can be substituted for two of the faster rotating metal gears, assuring quiet operation. All shafts are polished to 3 to 5 microinches. A ball thrust bearing against the rotor shaft assures minimum friction.

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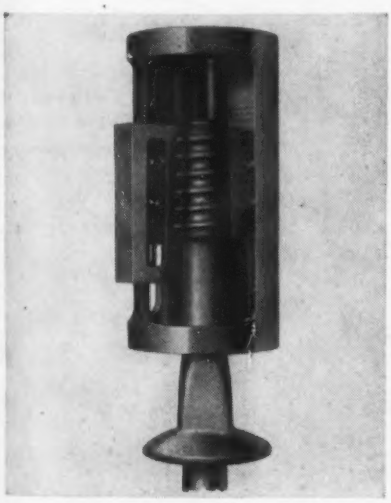

Thread Gage

THIS GAGE is designed for accurately checking thread diameters, tapers, and contours of insulator pins with one-inch diameter lead threads meeting the new Edison Electric Institute Specifications TD-17. The gage is manufactured by the Joslyn Mfg & Supply Co, 3700 S. Morgan St, Chicago, and is suitable for one inch lead or wood pins and is equipped with removable contour gages. The specifications include requirements on strengths, testing, material and inspection. The specification reduces materially the number of one inch steel pins now provided.

BAXCO

LONG-LIFE DOUGLAS FIR PRESSURE TREATED POLES

In transmission lines–distribution, lighting or telephone systems–wherever dependable service is of prime importance you can count on Baxco Long-Life Poles to do the job.

Baxco Long-Life Poles are strong, straight, machine shaved, Coast-type Douglas Fir pressure treated with creosote and pentachlorphenol to resist rot, termites and deterioration.

You'll be proud of these poles in your line and more than satisfied with their long maintenance-free service. Write or wire us your inquiries.

Also Produced by
J. H. Baxter & Co. of Oregon
an associated company
Plant and Yard–Eugene, Oregon

J. H. Baxter & Co.

333 MONTGOMERY STREET · SAN FRANCISCO 4, CALIFORNIA
LOS ANGELES · LONG BEACH · ALAMEDA · CALIFORNIA, U. S. A.

KEY FEATURES OF A COMPLETE STEEL SERVICE

Some types still short, but over-all stocks in 13 Ryerson plants are probably the nation's largest.

Prompt personal steel service on all orders, large or small, is a Ryerson tradition.

Accurate cutting to your order is assured by modern Ryerson equipment.

Over a Century of steel experience means more know-how applied to your steel problems.

You get quick delivery anywhere, because the network of Ryerson plants stretches from coast to coast.

PRINCIPAL PRODUCTS

BARS—carbon & alloy, hot rolled & cold finished
STRUCTURALS—channels, angles, I & H beams, etc.
PLATES—sheared & U. M., Inland 4-Way Floor Plate, etc.
SHEETS—hot & cold rolled, many types & coatings
TUBING—seamless & welded, mechanical & boiler tubes
STAINLESS—Allegheny metal sheets, plates, bars, tubes, pipe, etc.
REINFORCING—bars & accessories, wire mesh, etc.
BABBITT—and phenolic laminated bearing material
MACHINERY & TOOLS—metal working & boiler shop

Added Ryerson service includes a chart to guide heat treating sent with alloy shipments.

RYERSON STEEL

Joseph T. Ryerson & Son, Inc. Plants: New York • Boston • Philadelphia • Detroit • Cincinnati
Cleveland • Pittsburgh • Buffalo • Chicago • Milwaukee • St. Louis • Los Angeles • San Francisco

NEWS ABOUT PEOPLE

Holophane Co Elects Three Vice-Presidents

Announcement has been made by the Holophane Co, Inc, New York, of the election of Clarence C. Keller, Stuart R. Williams, and Kurt Franck as vice-presidents.

Mr Keller, who becomes vice-president in charge of sales, joined the Holophane organization in 1929. Widely known in the lighting industry, he has held several important positions in the company, rising to sales manager in 1943.

C. C. KELLER

Mr Williams, who has just been made vice-president in charge of street lighting, spent several years as a special representative of Westinghouse Electric Corp before joining Holophane in 1929. Appointed manager of the street lighting department in 1936 and assistant works manager in 1941, he has been active in both the factory and commercial branches of the business.

S. R. WILLIAMS

K. FRANCK

Joining Holophane as an illuminating engineer in 1935, Mr Franck became chief engineer with headquarters at the factory in Newark, Ohio, in 1946. His new appointment makes him vice-president in charge of engineering.

All of the newly appointed officers are active in the affairs of the Illuminating Engineering Society. Mr Keller has been regional vice-president, secretary of the New York section and a member of the council. Mr Williams is at present national chairman of the street and highway lighting committee and the society's representative on President Truman's Committee on National Safety. Mr Franck is local representative of the IES in Ohio and is serving on two important technical committees.

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▶H. W. KRATZER has been appointed director of industrial relations for the Kansas Power & Light Co, Topeka. W. L. PERDUE has been made advertising manager. Mr Kratzer has been industrial commissioner of the Topeka Chamber of Commerce for more than a year. He is a former executive assistant to the director of the Kansas League of Municipalities and served as sales representative for the Bendix Corp during the war, handling sales and engineering problems. Mr Perdue has been with Kansas Power & Light since 1946. He is succeeding MEL KENNEDY, resigned.

Bremicker Elected V-P of Northern States Power

Carl T. Bremicker, assistant general sales manager of the Northern States Power Co, Minneapolis, has been made vice-president in charge of sales. He succeeded H. E. Young who retired after 36 years with the company.

Bremicker, a native of Illinois, has been with Northern States in various capacities since 1924. He became assistant general sales manager in 1945 following his return from the Army.

C. T. BREMICKER

Young joined the Minneapolis General Electric Co, a predecessor company, in 1913. He became successively manager of power sales, sales manager, general sales manager, and in 1931 vice-president in charge of sales.

•

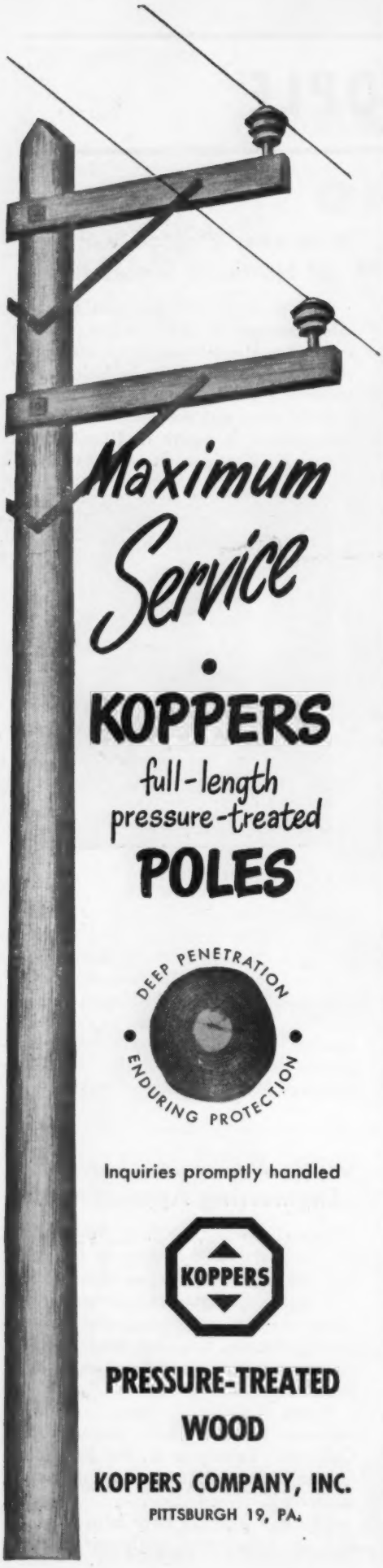
Utility Makes Mechanical Engineering Appointments

Consolidated Edison Co of New York, Inc, has announced changes in the mechanical engineering department.

WILLIAM E. CALDWELL, formerly in charge of the mechanical plant engineering bureau, has been promoted to the new position of staff engineer, department office.

HARRY KNECHT, formerly assistant mechanical plant engineer, succeeds Mr Caldwell. Taking over Mr Knecht's former duties is HARRY W. DIERMAN, formerly division engineer.

Two new bureaus have been organized in mechanical engineering: the



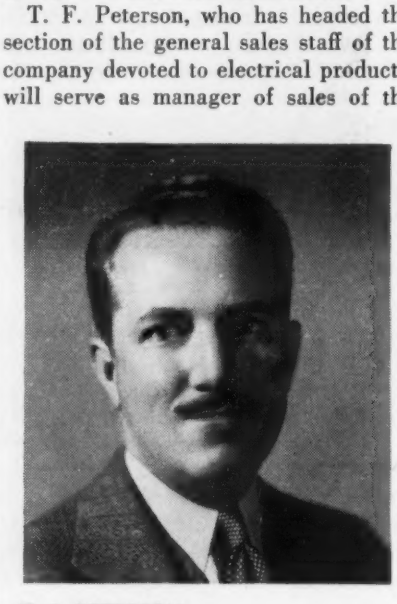
project engineering bureau, headed by JAMES E. WHALLON, formerly general superintendent of mechanical construction bureau, station construction and shops, and the resident mechanical engineering bureau in charge of EDWARD H. MAN, formerly special field engineer of the process department.

•

T. F. Peterson Heads New Wire, Cable Sales Division

Creation of a new and separate sales division to handle the electrical wire and cable products of American Steel & Wire Co has been announced.

T. F. Peterson, who has headed the section of the general sales staff of the company devoted to electrical products, will serve as manager of sales of the



T. F. PETERSON

new division. He started with American Steel & Wire as a cable engineer in the New York sales office, and in 1936, became director of the electrical cable works at Worcester. In 1941 he went to Cleveland as director of electrical cable engineering and research. Mr Peterson holds numerous patents in the electrical field.

C. H. Eisenhardt, formerly assistant manager of sales in the section, will serve as assistant manager of sales in the new division.

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▶ C. H. TALBOT has been appointed assistant sales manager for the commercial and distribution department, Shawinigan Water & Power Co at Montreal. W. J. LAVIGNE has been made supervisor of sales promotion.

▶ THOMAS H. BURTON has retired as chief engineer of steam stations in the steam section of Boston Edison Co. He had been with the company about 32 years. C. R. IRVING has been appointed acting chief engineer and H. E. STICKLE, acting assistant chief engineer.

Baldwin Elects Smith Executive Vice-President

Baldwin Locomotive Works, Philadelphia, has announced the election of Marvin W. Smith of Pittsburgh, Pa., as

M. W. SMITH

its executive vice-president. Mr Smith goes to Baldwin from the Westinghouse Electric Corp, where he was vice-president in charge of engineering and research.

An authority on power plant design and development, Mr Smith spent 33 years with Westinghouse and during the period 1917-30 was instrumental in many interesting developments. He was appointed division engineer in 1930, was named manager of engineering in 1936 and was elected vice-president in charge of engineering and research in 1939.

Mr Smith is a member of the American Institute of Electrical Engineers and the American Association for the Advancement of Science and is the author of numerous technical papers.

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▶ CHARLES P. WAGNER, manager of the farm service department, Northern States Power Co, has been appointed vice-chairman of the rural electric division of the American Society of Agricultural Engineers. B. D. MOSES, associate professor of agricultural engineering and agricultural engineer in the experiment station, University of California, succeeds to the chairmanship of the rural electric division at this time.

▶ RALPH M. BESSE, attorney, has been elected a vice-president of the Cleveland Electric Illuminating Co. He will be associated with Frank M. Cobb, general counsel for the company, in its legal department. In accepting the vice-presidency of the Illuminating company, Mr Besse is resigning his partnership in the law firm of Squire, Sanders & Dempsey, attorneys for the company.

with whom he has been associated since 1929. He is a member of the American, Ohio and Cleveland Bar Associations and is a director of the Ohio Chamber of Commerce.

OBITUARY

▶NEIL C. HURLEY, chairman of the board of Independent Pneumatic Tool Co, Aurora, Ill., died on August 2 at his home in River Forest, Ill., following a heart attack. He was 78 years old. Mr Hurley had been active in the company for the past 21 years, directing its affairs first as president, and then, since 1944, as board chairman. A native of Galesburg, Ill, Mr Hurley went to Chicago in 1906 to establish, with his brother, the late Edward N. Hurley, the Hurley Machine Co. He was a pioneer in the development and marketing of electrical appliances.

▶W. J. DORWORTH, who was manager of the Atlantic District for General Electric Co's apparatus department until his retirement last January, died on August 12 at Bellefonte, Pa. He was 67 years old. Mr Dorworth spent his entire business career in the electrical industry, and as a representative of General Electric, was closely identified with steel, textile, and marine industries as well as maintaining close association with U. S. Navy activities in the Philadelphia area. He was a member of the Electrical Association of Philadelphia, the Society of Naval Architects and Engineers and the American Iron and Steel Institute.

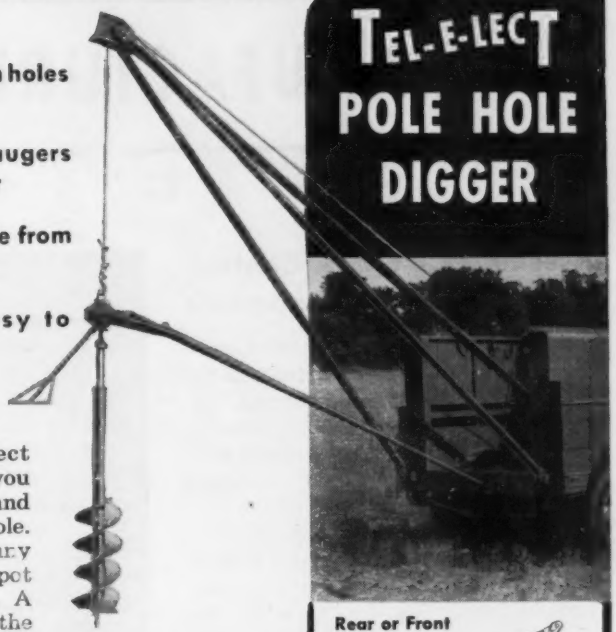
▶DEWITT CLINTON WEEKS, staff assistant of the process engineering department of the Consolidated Edison Co of New York, Inc, died on Aug 15 in Brooklyn, N. Y., at the age of 58. Mr Weeks specialized in technical problems of smoke reduction. He formerly was secretary and chairman of the fuels division of the American Society of Mechanical Engineers and had served on many committees of the Smoke Prevention Association of America.

▶JOHN E. LEAR, member of the North Carolina State College electrical engineering faculty since 1938, died at his summer home at Penland, N. C., on Aug 17. A native of Petersburg, Va., Mr Lear was chairman of the North Carolina State Board of Registration for Engineers and Surveyors, and was affiliated with a number of scientific societies. He joined the State College faculty after serving on the engineering school faculty of the University of North Carolina for 20 years.

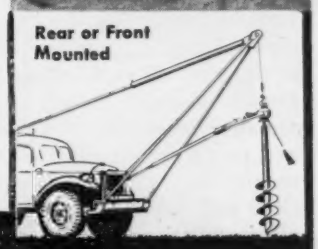
Operates ON ANY DERRICK TRUCK

TEL-E-LECT POLE HOLE DIGGER

- Adjustable for clean holes to 8 ft. deep
- Interchangeable augers 9" to 16" diameter
- Drills a straight hole from any truck position
- Easy to use—easy to transport



WITH the Tel-E-Lect Pole Hole Digger, you use the same truck and crew that sets the pole. You can drill a hole any place that you can spot the pole derrick. A single bolt attaches the digger to the truck; it works suspended from the derrick. Powered by the truck motor through a power take-off shaft, Tel-E-Lect is raised and lowered by the winch line. Fits the budget of even the smallest utility, and quickly pays for itself. *Ask for circular.*



MINNETONKA MANUFACTURING CO.
9603 MINNETONKA BOULEVARD, MINNEAPOLIS 16, MINNESOTA

National
engineers KNOW insulation

National offers more than insulation and service. *National knows how.* Through actual experience, the National Insulation Engineer knows how his material is manufactured—what it is designed to do—how it performs under the most difficult applications and how to use the insulation most efficiently in your plant.

National Insulation Engineers can offer production hint which often save time and money and make for bette employee efficiency.

Use National Service. A complete source of electric insulation materials. Delivery from large stocks.

You are protected by National's experience and National's extremely particular Inspection Department.

Send for a National Insulation Engineer—*today.*

NATIONAL ELECTRIC COIL COMPANY
COLUMBUS 16, OHIO, U. S. A.

MANUFACTURERS and MARKETS

Assemble Complete Control Centers As New Service

An addition to the line of the Electro Mechanical Devices Co, Detroit, is the final assembly of explosion-proof control equipment for use in refineries, utilities and other industries where safe, dust-proof and water-proof conditions are of first importance.

This new service is made possible through cooperation with the Crouse-Hinds Co, Syracuse, N. Y., which manufactures explosion-proof conduit enclosures for all classes of electrical equipment. The Electro Mechanical Devices Co will design and assemble complete explosion-proof control centers and power panels which will meet the requirements of the National Electrical Code and the most rigid local codes of all installations in the Class 1 and Class 2 hazardous locations. The service will bring to the purchaser of explosion-proof power equipment a simplification of unit construction and thus eliminate many of the complex problems of design, purchasing, and installation which result from the complicated requirements for safe electrical installation in hazardous locations.

In addition to the final job of assembling various pilot devices (contactors, relays, timers, etc) into a complete control center, Emdco offers an initial engineering service including layout and general recommendations.

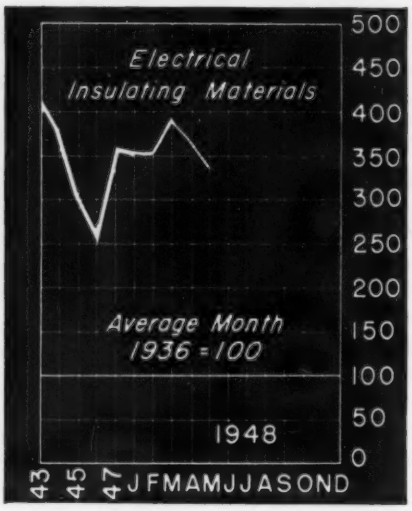
•

Cutler-Hammer Acquires West Electric Products

Recognizing the rapid industrial expansion in the Los Angeles area and the ever-increasing need for electrical apparatus in that territory, Cutler-Hammer, Inc, Milwaukee, have acquired the business of the West Electric Products Co, 1795 Pasadena Av, Los Angeles.

W. G. Tapping, district sales manager, will be in charge of the new plant. Sale of the company's products in the Los Angeles area will continue to be handled by the company's sales office located at 1331 Santa Fe Av.

The present operating personnel of the West Electric Products Co will be retained and the new plant will be integrated with other C-H plants.



Insulating Materials Sales Dropped 6% in May

Sales billed on electrical insulating materials during the month of May 1948 dropped 6% below those of April 1948, according to the index compiled by the National Electrical Manufacturers Association. The index moved downward 23 points, to 348 from 371.

In May 1947 the index stood at 361, this year's figure representing a decrease of 4%.

•

Appliance Company Deal

An agreement has been reached to sell the Waverly Products Co of Bridgeport, Conn., and Sandusky, Ohio, to the Rival Manufacturing Co, Kansas City, Mo., Charles S. Brody, counsel for the Waverly company, has announced. The Waverly company, now under bankruptcy proceedings, manufactures electric irons, employs 30 persons in a maintenance and service plant in Bridgeport and about 150 in a manufacturing plant at Sandusky. Both plants are shut down at present, Mr Brody stated.

•

Declares Extra Dividend

Cutler-Hammer, Inc, declared an extra dividend of 20c and quarterly of 30c on its common, both payable Sept 10. Extras of 10c were paid in March and June.

Induction Heating Sets Up Rental-Purchase Plan

Ther-Monic induction and dielectric heating equipment is now available to industry under a rental-purchase plan. Under the plan, recently established by the Induction Heating Corp, Brooklyn, N. Y., new or used (latter, when available) induction or dielectric generators may be rented on a monthly basis with the option to buy at any time. A portion of rental payments form an equity towards outright purchase.

This rental-purchase plan benefits the manufacturer who insists upon "proof prior to purchase," the manufacturer who for some reason or other would rather not make an immediate capital investment and the manufacturer who prefers a continuing "pay-as-you-go" arrangement.

•

Cincinnati Time Recorder Acquires Skinner Engine

Assets of the 100-year-old Skinner Engine Co, Erie, Pa., have been acquired by Cincinnati Time Recorder Co, one of the big units in the Schott brothers enterprise. Well over $1,500,000 was involved in the deal.

Skinner soon will have a part of its plant converted for the production of aircraft parts; mainly, landing gears and struts, at present the principal product of the Schott's Cleveland Pneumatic Tool Co.

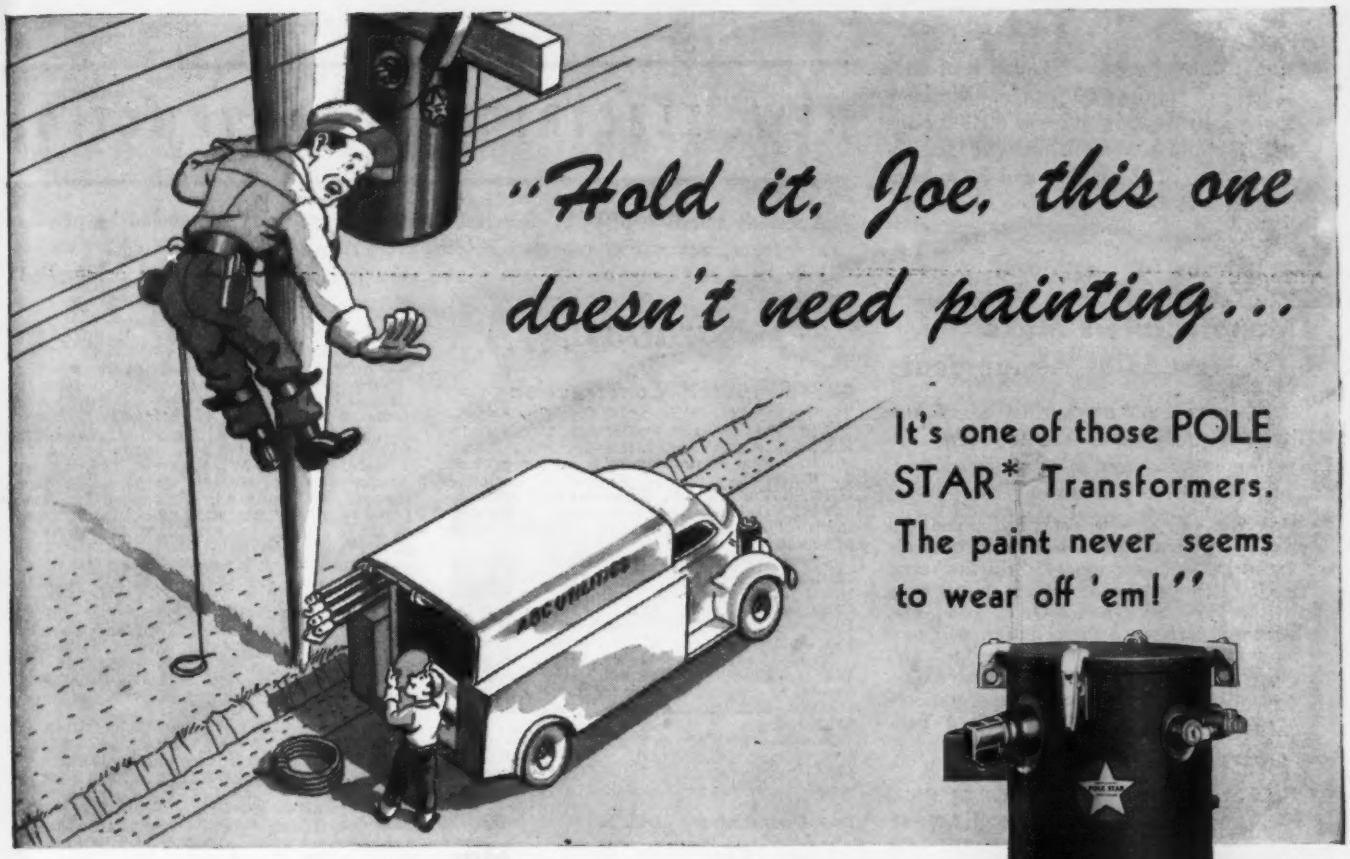
Hereafter Skinner will be operated as a division or subsidiary of Cincinnati Time Recorder with Joseph J. Schott as acting director, succeeding J. L. Skinner, the former president. A corporation will be formed to own the Skinner Engine Co name.

•

Mueller Electric Will Hold 40th Anniversary

The Mueller Electric Co, Cleveland, celebrates its 40th anniversary in the clip business on Sept 1. Ralph S. Mueller, founder and senior partner, states that the company will soon produce its 200,000,000th clip.

"Our modern plant," Mr Mueller


"Hold it, Joe, this one doesn't need painting...
It's one of those POLE STAR* Transformers. The paint never seems to wear off 'em!"
ACCUTILITIES

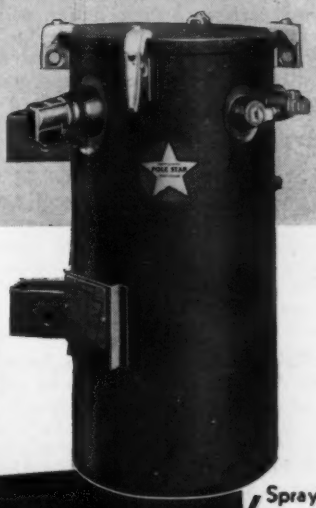
You can put that replacement back in the truck, Joe. That Pole Star Transformer won't have to go back to the shop for painting! Why? Because Pennsylvania Transformer Company takes exceptional care to properly prepare Pole Star tanks for painting, and to apply and bake on a tough, long-lasting, abrasion resistant, oil-proof paint.

Tanks of heavy gauge steel are shot-blasted with fine steel grit to free the tanks of all scale and rust and to clean the tanks right down to the base metal. Shot-blasting and only shot-blasting can do a thorough cleaning job on metal.

After they are cleaned, tanks are immediately covered with a red primer coat of paint that binds with the metal and provides the proper base for the two finishing coats of gray transformer paint. After each coat of paint is sprayed on, the tank passes on a continuous conveyor through an oven where the paint is thoroughly dried and baked on.

Paint for Pole Star Transformers is manufactured to Pennsylvania's rigid specifications; and assures the user of a finished tank surface that will neither check nor chalk, and that will maintain its fine appearance through years and years of all-weather service.

Embodying a new wound core design with an inherent low exciting current, POLE STAR Transformers are made in sizes 25 Kva and below, 14400 volts and below, single phase, 60 cycles, OISC, conforming to EEI-NEMA Standards.



Spray painting and oven drying.

Tanks cleaned by shot blasting.

* P.S. Let the POLE STAR be your guide

Product Of Safe Long Thrifty Experience And Reliable

Pennsylvania TRANSFORMER COMPANY

PITTSBURGH 12, PENNSYLVANIA

stated, "now comprises 30,000 ft of floor space and employs 60 people. We have a one-shift capacity of over 60,000 clips per day and have sold our products in every state of the Union and 76 foreign countries . . ."

•

Manufacturers Make New Sales Assignments

Electrical manufacturing companies have recently made the following appointments to their sales staffs:

Bakelite Corp, New York, has announced that P. G. Magnusson is now responsible for sales and service of "vinylite" and polyethylene resins, used for calendering, in the New York area. O. L. Law, who formerly performed these duties, will now be associated with servicing "vinylite" and polyethylene plastic customers. Mr Magnusson will be located at the corporation's headquarters, 30 East 42nd St, New York 17.

Robbins & Myers, Inc, Springfield, Ohio, has appointed John Logan, formerly assistant manager, manager of the New York office. Robert Freundt has been appointed manager of the Philadelphia office, succeeding Donald Ridgway, who has been made manager of the Chicago office.

The Fisher-Pierce Co, Boston, has named George A. Lowe representative in Atlanta, with headquarters at 687 Waywood Way, N. W. He will handle the company's photoelectric controls, including the sale of its streetlight controls in Georgia and Alabama and across northern Florida.

Standard Switchboard Co, Brooklyn, N. Y., has appointed the Electrical Distributors Co as its representative in eastern Pennsylvania, New Jersey, Delaware, Maryland, Washington, D. C., and Virginia.

Porcelain Products, Inc, Findley, Ohio, has appointed Paul D. McCulloch, McCulloch Sales Co, 708 Sixth Av, South, Minneapolis, representative in North Dakota, South Dakota and part of Minnesota; Slaybaugh-Thompson Co, 617 Gilpin St, Denver, Colo., in Colorado and Wyoming; Curtis Musgrove, 508 Southland Life Annex Bldg, Dallas, in Texas and Oklahoma. Mr Musgrove also maintains a Houston, Tex., office under the direction of Ormonde Smith, Jr, 3842 Palm Av.

Graybar Electric Co, Inc, New York, has appointed J. P. McCarthy as Newark (N. J.) branch manager. He has been with Graybar for 23 years.

•

Kennecott Up 2, Too

Kennecott Copper Corp has joined all other major copper producers in raising its copper price to 23½c, Connecticut Valley basis, from 21½.

NEW ELECTRICAL CONSTRUCTION

A weekly selection of U. S. electrical construction projects announced by private and government utility systems involving more than $70,000. Also listed are major industrial and construction jobs where electrical work is indicated or implied

UTILITIES

Proposed Construction

Fla., Jacksonville—City, furnishing, installing, condenser tubes for two 27,500 sq. ft. surface condensers for Power Plant 2. Plans deposit $2. Reynolds, Smith & Hills, 227 Park St., Jacksonville, engrs.

Fla., Orlando — Sunshine Television Corp., Orlando, television station. Over **$100,000.**

Georgia — Okefenoke Rural Electric Membership Corp., Nahunta, 348.75 mi. rural distr. lines in Brandley, Camden, Charlton, Glynn, and Ware Counties, Plans deposit $25. Southern Eng. Co., 699 Spring St., N. W., Atlanta, engrs.

Ind., Fort Wayne — Radio Station WISH, Frank McKinney, pres., Indianapolis, 2 story commercial bldg., radio station, incl. auditorium, N. Meridian St. **$400,000.**

Missouri — Farmers Electric Co-operative, Ernest C. Wood, mgr., Chillicothe, 480½ mi. rural distr. lines, 10½ mi. transmission lines, in Caldwell, Carroll, Charlton, Clinton, Daviess, DeKalb, Linn and Ray Counties, **$980,000.** Frank Horton & Co., Lamar, engrs.

Nebraska — Wheat Belt Membership Assn., Sidney, 252.3 mi. rural distr. lines in Cheyenne Co. **$225,000.** Flora Eng. Co., 1717 E. Colfax Ave., Denver, Colo., consult. engr.

Neb., Omaha—WOW Broadcasting Station, Insurance Bldg., plans by L. A. Daly, Insurance Bldg., radio broadcasting station, 35 and Farnam Sts. Over **$100,000.**

N. M., White Rock—U. S. Atomic Energy Comn., Box 1539, Los Alamos, 540 residences, 19 one story, brick, frame bldgs. incl. maintenance and warehouse, administration, fire and police, supermarket, grade school, post office, ice and milk house, power house, doctor and dentist office, utility and trailer house and guard house bldgs., Inv. 281-49-4. $4,000,000. Extended date. Walter C. Cook & Associates, 9001 Denton Dr., Dallas, Tex. archts. (sites and roads) Carter & Burgess, Century Bldg., Fort Worth, Tex., engrs.

North Carolina—U. S. Eng., 308 Customhouse, Wilmington, standby generator house, installing generator, necessary connecting wiring at Wilmington Reserve Fleet Site, Brunswick River, Serial No. Eng-31-075-49-3.

South Dakota — Bureau Reclamation, Dpt. Interior, Faith, electrical distr. sys. for Bixby Govt. Camp, Moreau River Unit, Missouri Basin Proj. Spec. R6-13 (Region 6).

Tex., San Angelo—West Texas Utilities Co., San Angelo, electric distr. sys. imprvs., addns. **$275,000.** C. L. Young, Abilene, engr.

Virginia — Virginia Electric Co-operative, Bowling Green, 375 mi. rural distr. lines, and other imprvs., Caroline Co. **$1,000,000.** C. W. Hylton, Bowling Green, consult. engr.

Wash., Wapato—Yakima Fruit Growers Assn., Wapato, rebuilding cold storage and packing plant. **$225,000.**

Wis., Sheyboygan—Wis. Power & Light Co., 22 W. Washington St., Madison Edgewater Generating Plant addn. 60,000 kw. steam plant. **$9,000,000. Sargent & Lundy,** 140 S. Dearborn St., Chicago, Ill., consult. engrs.

Low Bidders & Contracts Awarded

Ala., Mobile—State Dpt. Docks & Terminals, Mobile, Aug. 12, electrical work for docks under construction, from G. R. Wood & Co., 711 Virginia St., **$107,990.**

Arizona-Nevada—Bureau Reclamation. Dpt. Interior Bldg. 1A, Denver Federal Center, Denver, Colo., Aug. 12, four 20,000 kva. transformer, Schedule 1, Spec. 2265, from Moloney Electric Co., 5390 Bircher Ave., St. Louis, Mo., **$531,875.**

Arkansas—First Electric Co-operative Corp., Jacksonville, 107.43 mi. rural distr. lines, Pulaski Co., to Mid-South Constr. Co., Rector Bldg., Little Rock, labor **$37,677,** materials **$107,000,** total $144.677.

Colorado — Y-W Electric Assoc., Inc., Yuma, 219 mi. electric distr. lines, Yuma Co., to J. R. Foree, Topeka, Kan., labor **$58,437,** materials **$219,000** total $277,437. Wm. H. Burgwin, 422 N. 7 St., Fredonia, Kan., engr.

Colo., Walsenburg—Frontier Power Co., Walsenburg, remodeling plant, incl. installing new high pressure boiler, increasing turbine capacity, to Stearns-Roger Co., 1718-20 California St., Denver. **$270,000.**

Minnesota — Anoka County Light & Power Assoc., Anoka, 296 mi. rural distr. lines, Anoka Co., to Franzen Bros. Constr. Co., Palisade, labor **$139,729,** materials **$296,000,** total $435,729.

Tennessee—Duck River Electric Membership Corp., Shelbyville, Aug. 10, 256.9 mi. rural distr. lines, Bedford Co., etc., from Townsend Electric Co., Jackson. **$347,780.**

Wyoming — Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, Colo., 6,000 kva. substation at Pine Bluffs; transmission lines unit, Spec. 2297. Missouri Basin Proj., from Killoren Electric Co., Appleton, Wis., **$153,000.**

INDUSTRIAL, COMMERCIAL & PUBLIC BUILDINGS

Proposed Construction

Md., Oakland—Garrett Co. School Bd., W. W. Dawson, pres., Court House, Junior-Senior High School, Keyser Ridge, **$1,000,000.**

Mass., Boston—City of Boston Housing Authority, 10 Post Office Sq., preliminary sketches by Saul E. Moffie, 1318 Beacon St., Brookline, 648 veterans apartments, Washington St. and Commonwealth Ave., Brighton, **$7,000,000-$8,000,000.**

Mass., Quincy—City, City Hall, plans by Coletti Bros., 687 Boylston St., Boston, 3 story, ground floor, 40x140 ft., brick hospital addn., incl. power plant. **$1,500,000.** Hubbard, Lawless & Blakeley, 84 State St., Boston, plumbing and electrical engrs. Office of Hollis French, 210 South St., Boston, heating engr.

N. Y., New York—Louis Katz, 787 11 Ave., plans by Sylvan Bien, 565 Fifth Ave., 18 story apartment, 922-24 Fifth Ave., 73 St. **$2,000,000.** Weinberger & Weishoff, 33 W. 60 St., engrs.

N. C., Fulton—Fulton Housing Auth., City Hall, general construction, plumbing, heating, electrical work for 136 unit, 3 group garden apartments. $1,463,000. Plans deposit $25. Sargent, Webster, Crenshaw & Folley, 2112 Erie Blvd., E. Syracuse, archts.

Tenn., Knoxville — State Purchasing Dpt., Nashville, Beverly Hills Tuberculosis Hospital. $2,000,000. Bauman & Bauman, 813½ Market St., archts.

Low Bidders & Contracts Awarded

N. Y., New York—Triborough Bridge & Tunnel Auth., Randalls Island, design and construction 7 story parking garage, at Manhattan approach to Brooklyn-Battery Tunnel, to Thompson Starrett Co., Inc., 444 Madison Ave., Zone 22, **$3,500,000.**

Wis., Winnebago—State Dpt. Pub. Welfare, Madison, Aug. 10, general construction Medical-Surgical Bldg. at State Hospital, from George A. Fuller Co., 111 W. Washington St., Chicago, Ill., **$1,832,000.**

RECENT RATE CHANGES

DUKE POWER Co has been authorized by the North Carolina Utilities Commission to increase power and gas rates. The power increase will affect large industrial customers and is estimated to return additional gross revenue of $3,526,000 a year. Higher gas rates will gross an additional $232,000. The fuel clause was granted to increase by 0.0065¢ per kwhr for each 10 cents that cost of coal exceeds $7 a ton. This clause applies to customers, who use more than 15,000 kwhr monthly.

BOONVILLE (IND.) MUNICIPAL ELECTRIC PLANT put into effect on August 15 a new schedule of rates prescribed by the state Public Service Commission. Household consumers will benefit by a slight reduction in rates. Increased rates will be paid by large commercial users. Total income from the new rates will be slightly less than that from the old rates.

TELL CITY, IND., municipal electric plant has put into effect an emergency rate increase approved by the state Public Service Commission. The new rates will remain in effect for nine months. The new rate schedule permits a 25¢ monthly service charge and provides a charge ranging from 5¢ a month per kwhr for the first 300 to 1.25¢ for all over 20,000 kwhr. The increase will add $850,000 a year to the company's revenue, utility officials estimated.

ACCOMACK-NORTHAMPTON ELECTRIC COOPERATIVE, Parksley, Va., has been authorized to put into effect a rate increase, effective Sept 1. W. R. Goffigon, president of the co-op, filed a petition with the commission, asking approval of an increase of four mills per kwhr on each of five rate schedules. He stated the higher rates are necessary to keep the cooperative in a sound financial position. The commission approved the schedule.

CENTRAL MAINE POWER Co has received authorization from the state Public Utilities Commission to put into effect the schedule of rate increases, which it recently filed (EW, May 22 p 184). The new schedule, effective Aug 1, covers increases in residential and commercial rates, amounting to $1,140,000. All customers, except large industrial users, whose rates will be increased soon, are affected.

•

Kidde Names New Agents

New agents for Walter Kidde & Co, Inc, Belleville, N. J., have been appointed in Haiti and Panama.

•

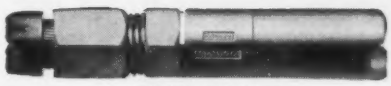
New Service Unit Set Up

In order to facilitate the servicing of Beckman Instruments in use throughout the Eastern and Middle Eastern areas, National Technical Laboratories, manufacturers of Beckman Instruments, has established its own factory servicing headquarters at 9 South Clinton St, Chicago. George R. Kinkaid, Mid-Western representative for National Technical Laboratories, is in charge.

DOSSERT BOLTLESS CONNECTORS

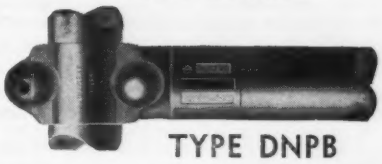
(Patent No. 2198964)

Supplied in various types of connectors embodying the no bolt connector principle

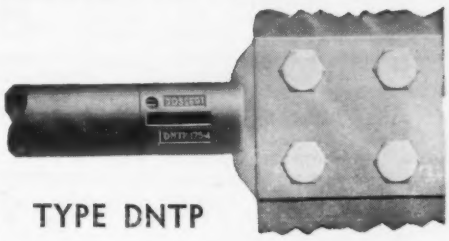


TYPE DNPC

TYPE DNCU



TYPE DNPB



TYPE DNTP

Easily and quickly installed.

High pressure, internal-expansion connectors provide permanent, vibration-proof grip on tubing.

Reduces bulkiness, and effects streamlining which facilitates taping and reflects neat appearance.

Also available in other types of fittings, such as: couplers, reducing couplers, elbows, and in various corresponding combinations of tubular bus and cable.

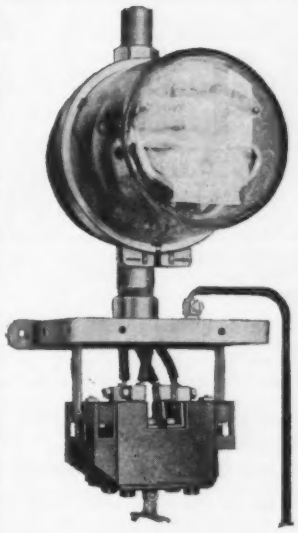
"Insist on a Genuine DOSSERT"

To be sure of a genuine DOSSERT make sure the name DOSSERT is on your connector.

Write for particulars to Dep't 2

DOSSERT MFG. CORP.
249-255 HURON STREET, BROOKLYN 22, N. Y.
SINCE 1904

KEES METER SERVICE SWITCHES



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All models completely enclosed in heavy 16-gauge steel cases. No openings where moisture and dirt can enter.

WEATHER-PROOF
Solid, tight fitting cases provide maximum protection against weather conditions.

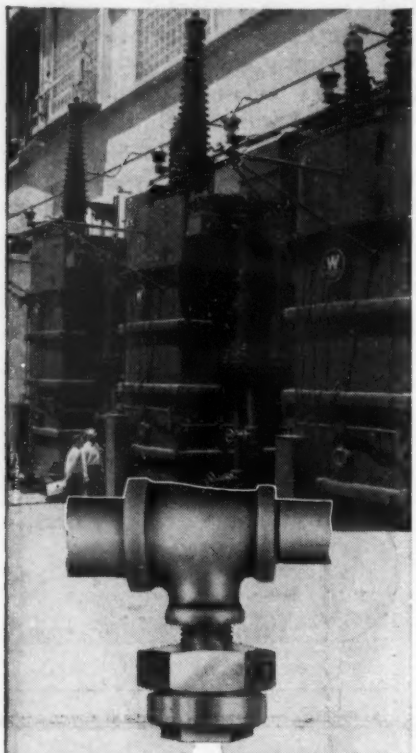
TAMPER-PROOF
Enclosed switches may be sealed or padlocked to prevent damage from unauthorized use.

KEES trouble-free service switches are designed to give years of dependable service. Meter engineers and repairmen everywhere prefer KEES meter switches because of their reputation for rugged dependability.

Write today for complete details and prices.

F. D. KEES MFG. CO. BEATRICE NEBRASKA

BLAW-KNOX
FOG SYSTEMS
OPERATE WITH THE SPEED OF ELECTRICITY



Activated by electric rate-of-rise supervised thermostats, they attack the fire instantly.

They spread a smothering cloud of fog over the fire, at the same time driving through to its base with a finely divided spray, cooling and quenching burning oil and inflammables.

Clear passages in these nozzles prevent clogging, and their spray pattern is maintained in emergencies even with reduced pressures.

Listed by Underwriters Laboratories, Inc.
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ALSO—
Blaw-Knox offers Standard Wet and Dry Pipe Systems, as well as Thermostatically Controlled Pre-Action and Deluge Systems.

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TECHNICAL LITERATURE

Switchgear—*"Guide for Specification on Indoor Metalclad Switchgear"* is issued by the AEIC-EEI-NEMA Joint Committee on Power Circuit Breakers. It contains engineering information applying to oil or oilless breakers having interrupting ratings of 50,000 to 500,000 kva, for 2300 to 15,000-v service. The publication No. Q-4 is obtainable from Edison Electric Institute; 420 Lexington Ave, New York 17, N. Y. Price 50 cents in U. S. A.

Line Materials—Reproduced drawings of typical structures for high voltage transmision line service and suggested bills of material for each structure are shown on over 40 pages of Bulletin GB-5076 issued by Graybar Electric, 180 Varick St, New York 14, N. Y. Second section of the 90-page publication carries illustrations and listings of line construction materials from adjustable bands and accessories to strain yokes.

Piping Materials—*"A.S.T.M. Standards on Steel Piping Materials"* is the 5th edition of a compilation of specifications. Contents by classes of materials covers pipe, boilers, superheater and miscellaneous tubes, still tubes, heat exchanger and condenser tubes, castings, forgings and welding fittings, bolting, and grain size. The 318-page publication is issued by American Society for Testing Materials, 1916 Race St, Philadelphia 3, Pa. Price $3 each for 1 to 9 copies.

Cables—*"Cable Operation, 1945"* is a compilation and analysis of high-voltage cable, joint and pothead data submitted by 16 contributors having 200 miles or more of high voltage cable above 7.5 kv. This is a joint report of AEIC and EEI committees and is issued as Publication Q-1 by Edison Electric Institute, 420 Lexington Ave, New York 17, N. Y. Price $1.75 to non-members in U. S. A.

Conduit—A 37-page section of a conduit guide contains many tables of electrical data, definitions of terms, electrical symbols and examples of computing conductor sizes. Another section of the 64-page combination handbook and catalog carries descriptions and specifications for hot-dipped galvanized and lacquered, electro-galvanized, and black enameled conduit, products of Spang-Chalfant Division of National Supply Co, Grant Bldg, Pittsburgh, Pa.

Lighting—"Improved Lighting" contains a table of illumination levels required to light work areas, a recommended procedure for lighting, and illustrations for various lighting applications. The 6-page folder is obtainable from Fostoria Pressed Steel Corp, Fostoria, Ohio.

Magnesium — Operations on formability and weldability of magnesium and its alloys, also physical characteristics of the metal and six other metals for comparison are presented in Tempil Topics, Vol. 3, No. 2, issued by Tempil Corp, 132 West 22nd St, New York 11, N. Y.

Water Coolers—"The Water Cooler Story" provides descriptions of general types of coolers, advice on choosing right type and number of coolers, suggestions for locations and floor plans of typical installations in large and small manufacturing plants, stores, office buildings, hospitals and filling stations. The 28-page booklet has been issued by Drinking Water Cooler Manufacturers Association, 1107 Clark Building, Pittsburgh 22, Pa.

Aluminum—An aluminum sheet and plate booklet has been released by Reynolds Metals Co, Louisville 1, Ky. It discusses cost factors, summarizes formability, weldability, riveting, brazing, machinability, contains weight tables and an index of specifications listed by various government bureaus and professional societies.

High-Frequency Data—Reactance charts, inductance chart, wire chart and decibel conversion tables are included in Catalog L issued by General Radio Co, Cambridge, Mass.

Alloys—On the application and uses of Cerro low-temperature-melting alloys, a series of loose-leaf sheets have been published by Cerro de Pasco Copper Corp, Dept. C-9, 40 Wall St, New York 5, N. Y.

Welding—Factual information on welding dissimilar metals and preheating is outlined in Tempil Topics, Vol. 3, No. 4, issued by Tempil Corp, 132 West 22nd St, New York 11, N. Y.

Transformers — "EEI-NEMA Recommended Standards for Distribution Transformers." This Fourth Report of a Joint EEI-NEMA Committee contains design standards for certain mechanical and electrical features of overhead-type, single- and 3-phase distribution transformers rated 500 kva and smaller, high voltage 2400-15000 v, low voltage 600 v and below. Publication 114 is obtainable from National Electrical Manufacturers Association, 155 East 44th St, New York 17, N. Y.; price 80 cents in U. S. A.

Turbines—"Definitions for Marine-Propulsion Steam Turbines and Gears." Standard definitions have been compiled to furnish a common language for use in developing standards for marine-propulsion steam turbines and marine-propulsion gears used with steam turbines. Publication 48-133 may be obtained from National Electrical Manufacturers Association, 155 East 44th St, New York 17, N. Y.; price $2 in U. S. A.

Wire and Cable — "Weather-Resistant (Weatherproof) Wire and Cable (URC Type)" contains standard specifications for the conductors, the materials used for the fibrous coverings and the saturating and finishing compounds. The publication C8.18-1948 may be obtained from American Standards Association, 70 East 45th St, New York 17, N. Y. Price $0.60.

Welded Design — "Designer's Guide for Welded Construction" lists welding symbols to simplify drafting problems, gives practical applications of American Welding Society symbols and includes properties of the company's base and weld metals. The 6-page publication is available from Lincoln Electric Co, Cleveland 1, Ohio.

Transformers—Canadian Standards Association, National Research Building, Ottawa, Canada, has issued publication C88-1947, "Standard Specification for Power Transformers," price $1. The specification applies to 25 and 60-cycle, oil or liquid-filled transformers, with capacity above 200 kva, in all voltage classes and also in all kva ratings above 15,000 volts.

Ohmmeter—Pocket-size instruction manual for use with the "Ducter" low-resistance ohmmeter contains useful formulas, sources of trouble, methods of tests, and curves for low-resistance testing, also principles of operation of the instrument. The manual 24J25 has been released by James G. Biddle Co, 1316 Arch St, Philadelphia 7, Pa.

Ammonia Machines—Detailed procedure in placing ammonia refrigeration machines into operation is the subject covered in a revised Application Data Section, AD-19-R, published by American Society of Refrigerating Engineer, 40 West 40th St, New York 18, N. Y. Price 35 cents per copy.

Materials Handling—"Some Basic Techniques in Materials Handling" is a report of proceedings at technical sessions of the Conference on Material Handling at Cleveland. The 84-page book may be obtained for $1 from Clapp & Poliak, 350 Fifth Ave, New York 1, N. Y. Included in the 20 papers is "Materials Handling Problems in a Public Utility" by R. A. Clark, Detroit Edison Co.

ILSCO
Electrical Connectors

MANY TYPES AND SIZES
WRITE for 54-page illustrated catalog.

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all the U. S. Saving Bonds
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Subox
ANTI-CORROSIVE PAINT
SubaLox
LEAD & ALUMINUM PAINT
Simplify Maintenance
Give Maximum Protection
Subox, Inc.
HACKENSACK, N. J.

Industrial Load

(*Continued from p 83*)

appraise the true costs correctly.

The controlling propositions are (1) that rates should be designed in the light of a knowledge of costs, (2) that rates for each class of service must be reasonably compensatory, and (3) that rates for the various classes of service should be harmonious with each other. If basic principles are observed in designing rates then there is no need to fear what may happen to the industrial load. Economic forces will decide the issues in the way that is best for the utility, for the industrial customer and for all other customers.

System Replaced

(*Continued from p 76*)

tor tie breakers are 2,000 ampere capacity. Distribution breakers are of 1200 ampere capacity. All have 250,000 kva interrupting capacity which is larger than the maximum available fault. Where gang operated disconnects are employed key interlocks are used to prevent them from being opened under load. A key interlock system is also used to prevent connection of one of the generators to more than one bus at a time.

Paper and lead distribution cables of 450 MCM radiate from a vault beneath the switch-house to 29 delta-delta connected 4800/480 volt transformer banks located as far away as one half mile. Various types of secondary distribution system are employed. The most modern has a 1,000 kva transformer feeding in at each end of a metalclad air circuit breaker switchboard through a 2,000-ampere, 75,000-kva interrupting capacity main breaker. Distribution circuits are fed from two buses through 50,000 kva IC air breakers. The two buses can be tied together by rolling one of the truck type main breakers into the tie position and by operating with only one of the transformers. Forty-six hundred volt motors in the power plant feed off a similar bus which has fault limiting reactors ahead of each main breaker. The main breakers have an IC of 250,000 kva while the motor starting breakers have an IC of 50,000 kva. In this case the two buses can be fed from each end while tied together by the tie breaker at the middle of the bus.

With induction heating an imminent possibility as well as the in-

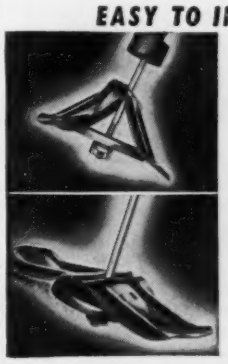
P-L*
EARTH ANCHORS

*REA APPROVED

P-L ALL STEEL, EXPANDING TYPE EARTH ANCHORS

Here is the first really efficient, two-piece earth anchor that is of simple, fool-proof, all-steel, heavy-duty construction. P-L Earth Anchors are exceptionally rugged and possess tremendous holding power. P-L Anchors can do a better job and can be installed quicker in all types of soil. Everyone from the engineer to the lineman can appreciate the ease of handling and installation.

EASY TO INSTALL



P-L Anchors come to you as assembled units. Built of two simple pieces of heavy steel plate. A few blows of the tamping bar and the sharp edged blades cut deeply and permanently into solid, undisturbed earth.

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